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YUKON PLACER MINING

DATA BASE STUDY

July 1, 1985

PLACER MINING
DATA DEVELOPMENT PROJECT

BOREAL ENGINEERING SERVICES LTD.
in association with
RLA RESEARCH
and

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APPENDIX: PLACER MINING DATA INVENTORY

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CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the major conclusions of the report and provides recommendations for what the consultants consider to be the key components for the establishment of a placer mining data base.

The initial study terms of reference were broad. Within the terms there was provision for narrowing the scope of the study and focusing the study efforts on a priority basis. This was achieved through a review of past literature, and individual meetings and written responses from committee members. The committee represents a very wide variety of interests. Therefore the statements of purpose for a data base and the data requirements were very broad. Based on a review of all of the above, it was concluded that the priority areas for a data base, which the consultants could handle within the scope of this contract, are those which answer the following questions;

i) What is the economic significance of the placer mining industry to the Yukon economy?

ii) What would be the impacts to the industry and the Yukon economy from regulatory changes which affected the industry?

iii) What are the tangible economic benefits to fish populations and the potential fishery from implementation of potential industry guidelines?

The above three areas in themselves are very broad. To be totally comprehensive they would require considerable more work than is possible within the scope of this contract. Although it is recognized that other areas of data requirements are also important they were considered to be beyond the scope of this project and should be the focus of future study efforts.

In doing this work it was considered important to look carefully at the following:

- data requirements to determine the cost to operators and the industry of implementing future potential guidelines;
- the purposes for which data would be gathered;

- the types of analyses the data might be subjected to;
- data collection methodologies;
- the relative ease or difficulty of data collection; and
- the apparent significance of various sectors to the Yukon economy.

It was felt important to consider the above areas, even though they were not necessarily specified in the terms of reference. They have a very definite impact on data collection and data requirements. This is particularly significant at this initial planning stage.

Due to the very broad scope of the project, the interim meeting with the study steering committee was used to obtain direction on how to proceed with the completion of the project. At this meeting a brief written summary was presented and a detailed presentation on findings, recommendations and directions was made. A general endorsement was received from the committee and directions were provided to proceed with completion of the report in a manner to be generally consistent with the presentation.

It must be recognized that once the specific data collection methodologies are selected, more planning work will be required. This will involve deciding on specific data elements, the specific format of the data and the location, storage and retrieval format for the data. This will be conditional by the confidentiality restrictions which are put on the data and will also vary with the various data sets.

Most of the necessary data elements for the data set are identified in this report. However much more discussion will be necessary with the agencies involved and the industry representatives before final decision can be made on the nature of some of the data elements, specific collection formats and the data storage and retrieval system. This is largely due to the confidential nature of much of the industry data and the cooperation that will be necessary to prepare a good data base.

Conclusions

The following is a presentation of some of the major conclusions which result from this study:

i) Individuals, organizations and agencies who are involved in placer related research want a very broad and comprehensive data base to work from.

ii) In general, the existing data that is available for placer related research is not good. It is not consistently collected and Data collection methodologies are very user specific. The data suits the purpose of the agencies which collect it but is generally not available for the type of research specified in this study. A complete description of the data files which were reviewed is presented in Section II of The Placer Mining Data Inventory which follows at the end of this report.

iii) Placer mining is a significant contributor to the Yukon economy. The extent of this significance is not precisely known. Reductions in the level of placer activity will negatively impact on the whole Yukon economy. This is especially true because the economy is small and is not well diversified. There are only a few important sectors and mining is one.

iv) There is a definite need for a good data base which is acceptable to all the user groups.

v) The data collection methodologies which will be utilized will be critical in determining the type and quality of the data which can be collected.

vi) Because of the dynamic nature of the industry, data becomes outdated very quickly. For a data base to be functional much of the data collection will have to be done on an on-going basis.

vii) A good input-output table of the Yukon economy would be very valuable as a tool for assessing the significance of and linkages with other sectors of the economy. The existing Yukon input-output table prepared for the Yukon River Basin Studies has very severe limitations which make its use suspect. Specifically the data on which the table is based does not appear to be representative of the sectors.

viii) It will be very difficult to estimate the cost to the placer industry for the implementation of future potential guidelines. This is so because operations vary considerably from one to another. The actual costs of implementation will be very site specific.

ix) Some of the current costs which operators now bear and which would be affected by potential new guidelines are for the following components:

- fish screens;
- control structures for intakes;
- 1:5 flood design;
- settleable solids objective of 0.2 ML/l;
- suspended solids;
- security;
- fish passage;
- stockpiling overburden and levelling off tailings;
- monitoring and reporting;

x) The data required for costing out potential new industry guidelines is very extensive and must be generated on a site-specific basis.

xi) There is currently no good information available on the relationship of the placer mining industry to the rest of the Yukon economy.

xii) The primary tangible beneficiary of potential guideline implementation is fish rehabilitation and the associated potential fishery.

xiii) The primary data required for measuring the tangible economic benefits of fish rehabilitation are:

- accurate identification of species and fish populations in all stream reaches that are mined and downstream waters that are affected.
- how potential guideline implementation will affect the level of protection and rehabilitation of species at different locations, i.e. specific counts of fish population changes;
- the proportion of the increased fish populations which will be harvested in the Yukon;

xiv) The data requirement specified in xiii) above will require a considerable effort to obtain.

xv) Tangible economic benefits from fish rehabilitation are only possible if fishing in Yukon is currently frustrated because of low fish populations and/or lack of access to fishing areas, or if future fishing demand will require fish rehabilitation.

xvi) There are essentially four data sets which are considered at this time. They are;

- industry data set;
- relationship of placer mining to other economic sectors;
- costs to operators and the industry of new potential guideline attainment;
- fish rehabilitation to be realized from new potential guideline implementation.

The specific data elements which comprise each of the data sets are identified and discussed in the report.

Recommendations

The following are some of the major recommendations of the study team;

i) That consolidation of the existing data on placer mining not be done because of the generally poor quality of the data for research purposes and its user specific nature. Rather new data sets need to be developed with the cooperation, for the sake of efficiency and duplication avoidance, with those who now collect similar type data.

ii) That a placer mining agency or institute be created having the following characteristics:

- a totally independent agency directed jointly by the industry and government;
- government funded;
- staff of the agency to be responsible to the board;
- the agency be the "one window";
- provide assistance to miners;
- set-up and administer the industry data collection;

- set-up the data collection so that it also functions as an accounting process for the industry and is thus of assistance to operators;
- set-up and be responsible to the miners for confidential maintenance of the provided data;
- Co-ordinate so that the data storage is with the Yukon government SAS;
- design and operate the data collection on a compulsory basis; and
- collect information from the operators on an annual basis.

If the agency or institute is not established, then other alternatives for industry data collection (two are described in the text) should be pursued. Whatever method is used, it should maximize universality, minimize the amount of data to be collected, assure and maintain confidentiality and be done with the co-operation and endorsements of the industry associations.

iii) That the data set to proceed with establishing now is that which identifies the relationship of placer mining to the other sectors of the economy. It would take approximately one year to complete this data set and would cost somewhere in the neighbourhood of $100,000 to $150,000.

iv) That consideration be given to up-dating and fixing the Yukon input-output table. If this is done then the data set described above becomes part of the input-output table and the table would serve a broader purpose than just placer mining. The cost of the I-O table would be in the order of $200,000 - $250,000.

v) That the data collection be done on an on-going basis with periodic up-dates to keep the information current and useable. The dynamic nature of the industry will make it desirable to up-date the industry data on an annual basis. The data set on linkages to other sectors of the economy need only be up-dated every three to five years depending on the extent of structural changes in the economy.

vi) That no new computer hardware system be set up for the placer mining data. Rather the data should be stored on the Yukon government SAS.

vii) That a bibliographic data base and complimentary library be established to provide access to works relevant to Yukon placer mining industry.

viii) That any data base, bibliographic or statistical should be developed in consultation with agencies currently maintaining related files or data bases. In this manner efforts will assure no duplication of existing data and permit for a co-operative effort in the collection of better quality data.

ix) That careful consideration be given to the data collection methodologies since they are critical to the establishment of good quality and acceptable data. Once the methods are determined, careful design work will be necessary to specify the data elements which can be collected using the methodology. Design for a specific system for data storage and retrieval, with confidentiality assured, will be necessary.

x) That the establishment of data sets not proceed with methods which will simply result in poor quality and not universally accepted data. This has been the case historically and has only served to cause problems and result in respondents not wanting to co-operate.

xi) That the data elements in any data set to be established be carefully assessed for their practicality and feasibility for obtaining. Practicality refers to the data having a worthwhile purpose. Feasibility refers to the ability of obtaining the data element for a reasonable cost and effort and still provide for acceptably accurate information. Efforts should ensure that relatively useless data collection for the sake of data collection does not occur.

xii) That the industry data to be collected by primarily the following:

- gold production;
- revenue of operation;
- total number of active operators;
- employment in man years;
- income;
- equipment investment;
- historical investment;
- non-labour operation and maintenance;
- off-site residence;
- source of expenditures;
- location of gold sales;

xiii) That the industry linkage data to be collected be primarily the following:

- historical sales;
- type and location of business;
- characteristics of business;
- business volume;
- type and proportion of business attributable to placer mining;
- employment;
- wages and salaries;
- type and source of business inputs.

xiv) That the economic sectors which need to be examined for their relationships with placer mining are the following:

- equipment dealers, parts, and servicing;
- fuel suppliers;
- tourism;
- transportation;
- government;
- legal and accounting;
- food and beverage;
- forward processing.

xv) That the research necessary to estimate fish species and populations and the extent of fish rehabilitation from potential guideline implementation not be done solely for placer mining purposes unless it is first determined that there is a

significant tangible economic benefit which will accrue to Yukon from fish population rehabilitation. The initial research to be done in fisheries should be an assessment of the potential for significant economic benefits to be realized from fish rehabilitation.

xvi) That if work is to be carried out on the costing of new proposed guideline implementation, it be initially done on a site specific case study basis. Since many of the data necessary for this are quite detailed and complex, and likely quite expensive to generate, the case study approach will serve to identify how the required data might be collected, at what cost and also point to the expected degree of data accuracy.

xvii) That consideration be given to indexing water quality, fisheries and other data in site specific studies of placer mining areas so as to provide access to it by both type of data and the geographic area it relates to. Such indexing could be provided either within the bibliographic data base referred to above or as a separate data base.

The above conclusions and recommendations result directly from the research that was done on this project. In most cases a detailed discussion is presented in the text which follows.

1.0 INTRODUCTION

1.1 Background

Gold placer mining is the reason why Yukon was developed and settled. It served as the main-stay of Yukon's economy from The Klondike Gold Rush of 1898 until the early 1920's. After this gold production declined. It increased in the 30's along with an increase in the price of gold. Production remained relatively stable until the 1960's when it declined to very low levels due to increased production costs and resulting poor economies. With deregulation of gold prices in the early 70's and the resulting rapid increase in the price of gold, production increased very substantially. The following table presents Yukon gold export statistics for selected years.

Table 1

Yukon Placer Gold Exports
For Selected Years

Year	Production (fine ounces)	Year	Production (fine ounces)
1899	774,000	1960	94,454
1900	1,077,553	1970	6,762
1905	348,800	1979	28,080
1910	220,092	1980	58,526
1920	66,049	1981	79,733
1930	35,320	1982	59,234
1936	50,109	1983	75,420
1950	94,036	1984	86,000

Source: Debicki (1983).

At 1983 prices the value of the gold produced was $36,759,000 in 1983.

The gold production figures that are presented represent a minimum since they are based on Yukon gold royalty payments. These payments are voluntary and do not include gold that is used in Yukon.

In addition to the direct employment and income effects that are generated by placer mining activities, indirect and induced effects contribute significantly to the Yukon economy. There is considerable disagreement on the extent of the contribution because the data from which to calculate this for mining or any other sector is missing and much of that which exists is not useable for these purposes. Nevertheless, recent studies tend to indicate that at present placer mining rivals tourism for being the second most significant contributor, next to government, to the Yukon's economy.

Placer mining activity generally occurs in river valleys along existing or old river channels. The activity is environmentally disruptive in that the land surface is changed through removal of surface vegetation and movement of soils. It also results in increased sedimentation of streams because water is used for sluicing and mining often occurs right in the streams. This in turn can have a negative impact on fish and wildlife populations.

During the 1960's concern regarding environmental conservation led to the enactment of the Northern Inland Waters Act. It provides for management and regulation of water resources. This act, along with the fisheries act, which provides for management and protection of fisheries and fish habitat, are used for the regulation of placer mining activity.

There have been considerable problems with interpretation and enforcement of the legislation. Proposed placer mining operating guidelines in regard to water use authorization were drawn up jointly by the federal government Departments of Indian and Northern Affairs, Fisheries and Oceans, and Environment. These have been objected to by the industry and the Yukon Government and eventually led to hearings in the fall of 1983.

The report from the hearings2., has as its' essence very significant questions;

What guidelines?
At what cost?
For what purpose?

Through the many submissions, reports and studies which were submitted to the hearings, many viewpoints and findings were raised representing as wide a variety of conclusions as presenters. This made it difficult for the Public Review Committee to be conclusive and answer the above questions. One of the major problems which was identified is the lack of credible data from which to assess the industry, its significance and impacts. From the hearings came a recommendation to establish a placer mining data base.

To that end the "Placer Mining Data Development Project Steering Committee" was formed. Steering committee members represent the following groups:

- Klondike Placer Miners' Association;
- Yukon Chamber of Mines;
- Yukon Prospectors' Association;
- Yukon Conservation Society;

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2. Resources Regulations and Reality, Report of the Yukon Placer Mining Guidelines, Public Review Committee, 1983. Ione Christensen - Chairperson.

- Yukon Territory Water Board;
- Northern Affairs;
- Renewable Resources;
- Environmental Protection Service;
- Fisheries and Oceans;
- Energy, Mines and Resources;
- Yukon Department of Mines and Small Business.

Terms of reference were drawn up for this study and a contract was let.

1.2 Study Purpose

The primary objective of the data development project is the eventual establishment of a set of reasonably reliable baseline data on the Yukon placer mining industry and related topics in accordance with the expressed needs, priorities and expectations of the various user groups.3.

An important aspect of this study was to bring all of the interested parties together to express the purposes for which they need placer mining data and to identify the types of data which would be of use to the various user groups. Further to this a recognized and very important aspect is the working together of the various groups and the striving for agreement on the data requirements and the methods of data collection.

Central to this project is the identification of the data that is required with respect to the placer mining industry in Yukon. Associated with this the methods of data collection become very important. A broad statement of purpose for a data base is contained in the Christensen Report and in the perceived need for this study. That statement of purpose is the recognition of a need

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3. Terms of Reference, Placer Mining Data Development Project, p.2.

for a data base from which to assess all aspects of placer mining activity. The data must be consistent, accurate and acceptable for use by all who will use it.

The scope of this study is such that not all of the necessary data elements can be addressed. This therefore necessitates the establishment of priorities as to which areas will be the focus of this project. This was achieved through an extensive review of existing data and assessment of its quality, through a review of the many studies and reports which have been prepared, particularly in association with the Christensen hearings, through extensive discussions with individual members of the steering committee, others involved in placer mining related activities, and from written statements of purpose from committee members. This is further discussed in section 1.4.

1.3 Methodology

The methodological process for this project was essentially as described below:

i.) An initial meeting was held with the committee to discuss issues, concerns, data requirements, existing data, data purposes and focus for the study. Each committee member was asked to provide a written statement of need and data requirements.

ii.) Subsequently each of the committee members was visited individually by study personnel. The purpose of these meetings was to identify reports and data sets on placer mining which they were aware of and/or involved in the preparation or collection of. Also general discussions were held on issues, concerns and their perceived need for a Yukon placer mining data base.

iii.) A complete bibliography of all readily identifiable reports with respect to placer mining in the Yukon was prepared. In addition an identification was made of all of the on-going data collection associated with the activity. The characteristics, location,

nature and methods of collection for the data sets were carefully reviewed and evaluated as to their accuracy, representativeness and thoroughness. Many of the reports were also reviewed and annotations are provided in the bibliography. A more complete description of the bibliography methodology is presented in the appendix along with the bibliography.

iv.) Written statements of purpose and data requirements received from the committee members were reviewed. On the basis of these the study was focused to deal primarily with the area of economic evaluation. This is elaborated in the following section.

v.) Several studies which make use of the most up-to-date data were reviewed. These are primarily studies associated with the Christensen Public Review. They include the following:

- Christensen Committee Report (1983);
- Yukon Economic Model;
- Yukon River Basin - Input-Output Model (1982);
- Draft Yukon Placer Mining Guidelines (1983);
- The attainment and cost of Placer Mining Effluent Guidelines (1983);
- Socio-Economic Impact Analysis of Guidelines (Can.Res.Econ. 1983);
- Benefit-Cost Analysis of Guidelines (Shaffer, 1983);
- Yukon Placer Mining Industry (Debicki, 1983);
- Assessment of Proposed Guidelines (KPMA-IEC BEAK, 1983);
- Discussion of Benefit-Cost Analysis of Guidelines (Conservation Society-House (1983));
- Impact on Yukon Economy of Placer Mining (Miller, 1979 and 1980);
- Contribution of Placer Mining to Yukon Economy (Econ. Dev. in-house draft, 1984).

These studies represent a very broad perspective and viewpoints representing industry, government and conservationists.

vi.) Based on their review, and combined with the interviews and review of other data sources, conclusions were drawn on the quality of the data, the data gaps, analytical methodologies, the industry, and data collection methodologies. Recommendations were then made on the priority areas for data collection in terms of data sets and how best to effect data collection.

vii.) Mid-way through the study a committee meeting was held and a detailed preliminary report was presented. Direction was sought and provided with respect to the areas of concentration for completion of the project.

viii.) A complete draft was prepared for review by the steering committee prior to finalization of the study.

1.4 Statements of Need

The following represent the main elements from the statements of purpose and need that were received from the committee members. The committee representatives who made the statements are identified. It should be noted that not all of the statements made relate to a statement of need; some are policy questions well beyond the scope of this study and others probably belong better in other places, such as reference manuals, than in a data base. Nevertheless all major comments were included since they represent the wishes of the various user groups and are also evidence of the very broad range of needs with respect to placer mining activity and data analysis.

i) Klondike Placer Miner's Association:

- Need a factual data base that would assist both government and industry to conduct their business from a more representative reference point.
- Need a more accurate record of money spent in the area of placer exploration, development and mining operations.
- The need for the industry to sustain an average profitable income should be carefully considered during any regulatory change so that a vital section of the Yukon economy is not sabotaged through carelessness.

- Required major elements of a reference data base are:
  - i) requirements to establish a legal claim;
  - ii) requirements to establish and sustain an operation;
  - iii) a definition of the regulatory control authority;
  - iv) annual economic data:
    - a) Operating costs - fuel
      - labour
      - maintenance
      - miscellaneous
    - b) Capital expenditures - within Yukon
      - outside Yukon
  - v) physical parameters
    - geographical areas mined
    - area of disturbance annually
    - volumes stripped and sluiced
    - gold production

ii) Yukon Chamber of Mines:

- The study should concentrate on the gathering of hard economic data which will allow for direct economic comparisons.
- Permit the identification of the direct contribution of the placer mining industry to the Yukon and Canadian economies.
- Permit the identification of the indirect contribution of the placer industry through spinoff effects such as tourism, small business support, infrastructure provision, export credits, etc.
- Enable the identification of the direct contribution of the fishing industry in placer areas to the Yukon and Canadian economies.
- Enable the identification of spinoff effects on the fishing industry in placer areas in terms of tourism, small business support, infrastructure provision, export credits, etc.

iii) Environmental Protection Service:

- . Alphabetical listing of all licenced placer operators/companies.
- . Listing of all operators by creek, mining district.
- . Listing of all operators by size, such as:
  - number and type of heavy equipment
  - instantaneous water use.
- . Listing of operators by stream sensitivity.
- . Plotting of operators by UTM coordinates leading to mapping, density determinations of areas of impact.
- . Entry and listing of Water Board data on each operator such as:
  - compliance of each miner with reporting requirements
  - miner's effluent monitoring data
  - other information from miner's annual reports
  - summaries, listings, sample results of effluent monitoring by water inspectors
  - frequent (monthly?) updates on status of licences

iv) Yukon Prospectors Association:

- requirements for an operator to prospect placer
- requirements for a miner to placer mine
- statistics on yearly investment of prospectors and miners
- statistics on yearly royalties paid
- number of people working directly or indirectly in placer prospecting or mining
- requirements of the water Board
- list of available data concerning other resources
- restoration requirements and costs.

. The provision of data information which would help placer mining to continue and do less damage to the environment.

. Data identifying environmentally sensitive areas should be included.

v) Indian and Northern Affairs Canada:

. Facilitate economic analysis of the placer mining industry.

. To provide sufficient data to allow accurate estimates of the effects of various regulatory decisions at both a site specific and regional level.

- To provide sufficient data to allow an acceptable SEIA to be prepared for various regulatory regimes.
- Present performance of the industry (effluent quality, investment in environmental protection, costs of operation, gold recovery, profits).
- Cost of meeting various levels of effluent control and stream protection (cost of recycle, cost of pond expansion, cost of berm construction, engineering costs, opportunity costs, etc.).
- Ability of the mine operators to meet various levels of effluent control and stream protection (opportunity for pond expansion, site constraints to improved treatment or stream protection measures, cost of upgrading in relation to present and potential profits).
- Benefits associated with meeting the various levels of effluent control and stream protection (fisheries, recreation, wildlife, domestic water supply, inter-miner conflicts, aesthetics).
- The purpose of the data base is to provide decision makers with the information they require to assess the effects of their decisions. The costs and benefits and to whom they will accrue must be known.

vi) Yukon Conservation Society:

- Including economic factors, what is the impact of the placer mining industry on the renewable resource sectors of the Yukon (tourism, recreation, wilderness guiding, fisheries, sport, commercial and subsistence, forestry, critical habitat, hunting, trapping)?
- Assessing water licence applications.
- Assessing land use permits, mining leases.
- Assessing environmental impact statements.
- Preparing position papers on environmental regulation and the mining industry.
- Preparing position papers on economic development strategies for the Yukon.

- Assessing resource conflicts between the value of renewable resources base and non-renewable resource activity.
- Fisheries value - commercial, sport and subsistence.
- Recreation value and potential.
- Tourism value and potential.
- Critical or significant habitat of the area, including wetlands, raptor, big game, small game and fur bearer habitat.
- Trapping, hunting and outfitting value and potential of the area.
- Forestry value and potential.
- Significant historical and archeological sites in the area.
- Value (net and gross) of individual placer operations and the placer industry as a whole.
- Operating costs.
- Rehabilitation and restoration potential and cost.
- Physical properties of the site including feasibility for settling ponds, recycling water, restoration.
- Status of operator - out of territory, resident.
- Status of employees - out of territory, or resident.
- Estimates of revenues to the territory.
- Estimates of revenues out of the territory.

vii) Fisheries and Oceans

- Information enabling the preparation of a benefit-cost analysis is needed to answer questions of the overall level of economic efficiency in the industry at present and what changes in efficiency would occur as a result of regulatory changes.
- Volumes of pay gravels moved.
- Type of earth moving equipment.
- Volume of overburden moved.
- Water volume per second used.
- Costs of water system.
- Length of operating season in days.
- Average number of hours worked per day.

- Number of employees.
- Data on aggregated (territory wide) gold production by year.
- The proportion of gold production by non-Canadians.
- For fisheries a model of the commercial salmon fisheries including the Han Fish Company processing facilities should be developed.
- A related model of commercial freshwater fisheries should also be developed.
- For the sport fishery a survey would need to be conducted to determine the value of an angler day to both resident and non-resident anglers.
- Some acceptable economic value would have to be placed on the Indian food fishery for both salmon and freshwater species.
- For other potential resource uses such as hunting, non-consumptive recreation, wood production and other land uses, values should be determined as possible.
- Employment data is needed.
- Mining operations' expenditures for equipment, fuel, accommodation, food and clothing, repair services and replacement parts.
- Location of expenditures.
- Employment and expenditure data on fisheries.
- Data on hunting and outdoor recreation.
- Interference of traplines by placer operations.

viii) Yukon Department of Renewable Resources:

- Accurate information on the location of placer mining, extent of operations and locations of access.
- Information on the process (a model?) leading to the ability to compare renewable and non-renewable resources in sound economic terms.
- Wildlife information.

ix) Yukon Mines and Small Business:

- To provide a data base which will permit a good economic analysis of the placer mining industry.
- Information which will enable an accurate assessment of regulatory changes on the placer mining industry and on individual operators.
- Data which will permit identification and assessment of the relationship of the placer mining sector to other Yukon economic sectors.

1.5 Study Focus

As evidenced above, the desired purposes for a placer mining data base and the data requirements are in total very broad. It is clear that in composite the committee members would like a comprehensive data base that could be utilized for economic, social and environmental assessments of the placer mining industry.

This comprehensiveness is beyond the scope of this study because it can't be done within the available time and budget. It was therefore necessary to narrow and focus the study on the basis of priority areas. The priority areas come from the statements of need, from the emphasis which is placed on these in the literature, from a thorough review of the Christensen Report and from interviews with committee members.

It was concluded that the areas of purpose which comprise the emphasis of this study should be the following:

i) to do economic assessments of the placer mining industry;

ii) to determine the economic impacts of potential regulatory changes on the industry and on mining operations;

iii) to identify the economic trade-offs between mining activity and the fishery through fish rehabilitations which will occur as a result of potential new water use guidelines.

The above mentioned three areas were selected for the following reasons;

i) Based on the review, these appear to be the most significant for which there is an expressed need.

ii) The focus is clearly economics at this stage since the economic significence of the industry is at the crux of most of the questions regarding placer mining.

iii) It has been concluded that placer mining is currently a very important contributor to the Yukon economy. This significance and the relationship to other economic sectors must be identified in order to fully understand the impacts of proposed new industry guidelines on placer mining and on the whole of the Yukon economy.

iv) It is simply not posssible within the scope of this study to address and satisfy all of the various user groups data needs.

It is recognized that other areas of an environmental nature are important and need to be addressed. However this will have to be done in subsequent efforts as part of an on-going process of establishing a good data base related to the placer mining industry. Eventually a comprehensive data base which meets all of the various user group needs should be established.

The three immediate priority areas listed above are themselves very broad and necessitate some restriction within the scope of this study. The following chapters then deal in detail with the creation of a data base, which well satisfy the three statements of purpose previously identified.

2.0 DATA COLLECTION METHODOLOGY-INDUSTRY DATA

From the foregoing review of the most recent studies, from the interviews with committee members and others who have data related to placer mining, and from an assessment of existing data sources, there are several major conclusions which can be drawn:

1) The data base from which to work is not good. The files of published and unpublished data which were reviewed are described in the final section of this report. For each file an identification is made of the department responsible for collection. The data collected, the methods of collection, the frequency of collection, a contact person and general comments.

   The files were evaluated on the basis of the following criteria, for the analytical purposes previously described:
   - consistency of collection;
   - sampling and collection techniques;
   - general response rates;
   - nature of the data;
   - acceptance of the data;
   - recent applications of the data; and
   - general interpretation and accuracy.

   On the basis of the above, it was generally found that the data are not consistently collected and that they are very user specific, i.e. intended for the specific purposes of the agency which does the collection. This is evidenced by the applications of the data in the many reports prepared for the Christensen hearing and the large degree of interpretation the data was subjected to.

2) It would likely be very difficult for the agencies and departments which now collect data to expand their efforts to gathering the required data as described in this report. This

is primarily because most are not geared for this type of effort, they themselves do not specifically need all of the data which is required, and in some cases they are not sensitive to the environment in which it would be collected and would in any event need outside assistance.

Also the third party image of the data collection group, for the industry data, is very critical to the co-operation that is necessary from the industry for this exercise to be successful. For these reasons we conclude and recommend that the data gathering be done by an independent "outside" group or through the creation of a special "agency" or "organization".

3) The analytical methodologies utilized in the conduct of Placer mining economic assessments have been varied. These include the use of socio-economic impact statements and benefit-cost analysis. There are many arguments about the pros and cons of each. The use of benefit-cost analysis has not been well applied in some of the placer mining industry assessments which were done. Benefit-cost analysis was not intended for the applications it was put to in the placer mining economic studies. Care must be taken to select appropriate analytical techniques. The selected technique has an influence on the data that is required for proper application.

4) The placer mining industry is a significant contributor to the Yukon economy. The various studies, using varied methodologies, do not agree on the significance of the industry to the economy. The percentage contribution varies considerably from one study to the next. However no one disputes the importance of the industry. The concentration should be on the effects to the Yukon economy from changes in the industry, particularly with the potential implementation of alternative guidelines and regulations.

5) The need for a good and acceptable data base is definite. The data base needs quality. Since significant costs can be associated with its development, it should be done over time and on a priority basis.

2.1 Data Collection Methodologies

The data collection methodology is critical from the viewpoint of quality, acceptance and cooperation. Existing data on the linkages of the industry to other Yukon economic sectors, on the leakages out of Yukon and on the general economics of placer mining operations are very sketchy and subject to broad interpretation. This includes information such as the following:

- production of gold;
- employment;
- capitalization;
- operation and maintenance;
- source of purchases.

There are various reasons why this data are not available or if available comes from various sources and are subject to variations and differences of opinion in use and interpretation. The major reasons are the following:

- the industry is very dynamic;
- until a few years ago there was not an urgent perceived need for good quality data;
- much of the data must be obtained from the operators;
- there is a lack of cooperation and trust among industry, government and other involved organizations.

Given the relatively recent recognition of need for good information, there has not been time to collect or plan for a good data base. Most of the effort has been crisis reaction e.g. the many studies prepared in reaction to the Christensen Hearings, in reaction to the proposed guidelines.

The industry and viability of operations changes continuously. This in large part follows changes in the price of gold. As everyone recognizes, the price deregulation of the early 70's and the tremendous price increases which followed, resulted in a surge of mining activity. This obviously led to a recognition of some of the trade-offs and pressure for guidelines. Miners have always been there and because of their long history have a sense of "First Right". However, it is also clear that the industry does not wish to be irresponsible and is quite prepared to be cooperative. This rapid state of flux in the industry will necessitate on-going data collection, since the impacts of regulatory changes will vary considerably over time and from one operation to another.

The lack of cooperation, trust, and understanding is evident. It is absolutely essential that a good atmosphere be created or the establishment of a data base from which to do proper assessments of impacts and regulations will be not be possible. Much of the data that is needed must be obtained directly from the operators. Attempts at doing this in the past have not been successful. This is evidenced by the manner of employment counts, the uncertainty about production, the 10% voluntary response rate to requested information for the preparation of the Yukon Input-Output Model, etc. Future futile attempts should be avoided since they simply tend to erode the potential for industry cooperation.

It is suggested that a framework for data collection is necessary as a prerequisite to specifying data collection methodologies and all of the specific elements of a data base. By this it is meant that the context within which the data will be collected will determine how the data can be collected and this will in turn determine the specific data elements which can be collected. For example, alternative frameworks might be;

- internally as a government department in-house project.
- use of an outside agency.
- creation of a special agency.

Each one of these has its own limitations as well as potentials and will not necessarily result in the same type or quality of data nor permit the same methods of collection. This is further exemplified through the following three alternatives which are described in detail.

2.1.1 Framework for Data Collection: Alternative A

1. Establish a placer mining agency to function as a totally independent body. Provide the agency with a very clear mandate specifying all of the roles, responsibilities and limitations of the agency. Delineate the linkages between the agency and the various government departments involved in placer mining.

2. The agency should be government funded. This may not necessitate a significantly large outlay, since to some extent there will be a transfer of some responsibilities from government to the agency. Governments often invest in sectors of the economy. This should be considered a public investment in this important economic sector.

3. To maintain its independent status, the agency should be administered by a board of directors. The directors should be comprised of an equal number of representatives from government and from the industry (KPMA, Prospectors Association, and Chamber of Mines).

4. The staff of the agency should be responsible to the board only. The staff should be kept at a minimum; one manager with a good knowledge of the industry, good public relations skills and ability to collect and handle information. One assistant to perform clerical duties and deal directly in assisting operators and prospectors and possibly additional seasonal assistence as required.

5. The agency should act as the "one window" for the miners and prospectors. All information needed by the industry, all application forms and all procedures should be available from the agency. Applications should be accepted by the agency for referral to the line departments and the water board. An area of concern, identified by the industry is a guide or reference manual for prospectors and miners on what to do and what is required of them by government. The agency would provide this guiding function.

6. One of the primary functions of the agency would be to provide assistance to the industry in filling applications and in compliance with the various government regulations. Another very important function would be to collect data from operators on an annual basis. For a placer mining data base to be useful, it should be universal (which means it has to be mandatory), it should be annual because of the dynamic nature of the industry, and it has to be set up with the cooperation of the Klondike Placer Miners' Association (KPMA), the Prospectors Association, and Chamber of Mines.

   Since much of the data to be gathered will be of a private business nature, it must be made perfectly clear to the associations and the operators that the data will not be traceable to individual operators, that it will only be used in non-identifiable aggregate form, that it is provided by the operators in trust to the agency, and that the agency is liable for any release other than its intended purpose.

   The specific data storage and retrieval system should be with the Yukon Government SAS computer system. Safeguards should be built between the agency and the Department of mines and Small Business to ensure no leakages of information.

   The specific format for data gathering will have to be prepared by an independent professional consultant. The final

format to be approved by the board of the agency. It should be simple and not collect useless information simply for the sake of collecting data. The data collected should also emphasize that which can reasonably and relatively accurately be provided by the operators. In achieving this, the ultimate purpose of the data elements should be carefully specified.

7. The operators, through their associations, must be made aware that this agency is for their benefit, that it will provide them with the required regulatory assistance and be the sole source for information and applications. Another area of benefit is that it will enable the establishment of a comprehensive and accurate base of information. The final but significant benefit will be in the establishment of a mechanism which will bring the industry and government together in a cooperative venture. The old conflicts and need for studies from alternate viewpoints should then be reduced or eliminated.

There is however a very obvious trade-off. For this to be effective all operators must be compelled to provide the required information. This might be done in several ways, one of which would be to require placer miners and prospectors to obtain an annual licence. Prior to the season commencing, they would obtain the licence (at no cost) from the agency. The agency could then obtain appropriate information on plans, locations of activity, etc. Also at this time they could be presented with a simple system of record keeping while they are in operation. At the end of the season they would then be assisted by the agency in completing the records and providing the requested information.

The emphasis must be on the following:

- total assured confidentiality;

- collect only data which has an express purpose and for which simple accurate records can be kept;
- keep the data collection simple;
- maximize the assistance provided by the agency to the operators in the provision of data; and
- design the record keeping system so that it can be of assistance to the miners with their own bookkeeping.

2.1.2 Framework for Data Collection: Alternative B

This alternative is inferior to Alternative A. However it is still preferable to historical methods which include notes to file on equipment and employment, observations when inspections are done by water management officers, and voluntary responses to mail surveys.

The alternative would be to design a very precise information/data format to be personally administered by people specially trained to do so. To be comprehensive the data collection would have to be done at the site of activity and should be completed as close to the end of the season as possible. This would allow for good data to be obtained on the current year of operation. Notification of this occuring, the type of data required and a record keeping format should be provided to the operators along with a phone call prior to the season commencing.

It is important that the data collection methodology be kept simple and straightforward in order that the time input of the operator be kept at a minimum. The endorsement of both the KPMA and Prospectors Association is very important. All operators and association members should be made aware in advance, directly and through their associations, that this will be occuring with endorsement from the associations. Confidentiality would need to be guaranteed. For this reason cooperation would be better, if the collection were done through an independent outside agency.

Due to the dynamic nature of the industry, the survey should be repeated every year preferably, or at least every two years.

2.1.3 Framework for Data Collection: Alternative C

This is the least preferred alternative but is still preferable to historical methods. It involves a self-administered information survey to be returned on a voluntary basis with confidentiality guaranteed. Again this would be better done through an outside agency and with the endorsement of the associations.

It involves sending a clearly defined record keeping format and information request to the miners and prospectors prior to the mining season. The endorsements and guarantees would accompany this as well as a request to return the information by a certain time at the end of the season. Phone calls to the operators should be made prior to the information request going out, again after sufficient time has been allowed for receipt and review to provide clarification as needed, and again at the end of the season to encourage returns. The major disadvantage of this method is that it is still on a voluntary response basis and as such biases are introduced in the data collection. Since the biases are not readily identifiable it is very difficult to adjust.

2.1.4 General Comments

Whatever method of data collection is chosen, it is very important that the explicit endorsement and cooperation of the associations be obtained. This is especially important because this data must be obtained directly from the miners and prospectors. Historically the lack of operator data have presented one of the most serious data gaps for required analyses.

The method that is selected will determine the quality of the data and the subsequent confidence in the analytical work that is done utilizing this information. The method ultimately determines the level, quantity, quality and type of data that can be collected.

In the following section data that is needed for the associated analysis is described. Differences may occur with the ability to collect this information depending on the data collection methodology utilized. An attempt should be made to stay away from analyses or data that would be nice to have but are of a more limited usefulness.

2.2 Analyses and Data Requirements

2.2.1 Analyses

The following describes the data that are required to do a relatively basic socio-economic impact assessment of regulatory changes which may affect the industry; in other words to assess the impacts on the industry and the Yukon economy of regulatory changes. It is also data that are necessary to determine the significance of the industry to the Yukon economy.

To do a thorough and accurate analysis, it would be desirable to have a good Yukon input-output table from which to work. The existing input-output table for Yukon, prepared for the Yukon River Basin Study, has severe limitations. It is a good effort for the first I-O table of Yukon and the derived multipliers and the identified linkages in the tables can provide useful indications. However, for several sectors including placer mining, the values in the table are based on too few returns. A 10% return for the placer mining industry does not provide data which can be considered representative of the industry. This therefore introduces unidentifiable inaccuracies and biases necessitating caution in the use of the information.

It is suggested that consideration be given to verifying, updating and improving the I-O table for Yukon. This will essentially require reconstruction of the I-O Table through the collection of data which is truly representative of the economic sectors.

The I-O table is a very useful analytical tool to aid identification of impacts on the economy from changes in placer mining activity. The I-O table would also be very useful for general economic analyses of other sectors and the Yukon economy.

In identifying the following economic data requirements, the specification of highly intangible economic values is avoided. Examples of these include; the value of maintaining forest cover, the value of a natural landscape, and the value of wildlife that is not harvested. These are best left to environmental evaluations which quantify on a numerical scale and qualify the impacts on each of these. The impacts can take the form of maintenance or rehabilitation. Attempts at imputing economic values to these are most often controversial and very subjective. Other techniques such as a "modified delphi" can be used to impute objective ratings and rankings to each area. The result is that the intangible values are not evaluated as part of the economics, and therefore don't distort the economic values. Instead they are evaluated along with the economic values. The data necessary for the environmental evaluations is mostly different from that needed for the economic evaluations.

2.2.2 Data Requirements

The following is an identification of the various data elements that are required from miners and which are necessary for economic analyses. There is a considerable amount of additional information which might be nice to have, but is of limited usefulness. This is not dealt with here.

The emphasis is on the identification of data which is important to the analysis specified above and on keeping the total data requirement at a manageable and reasonable level.

- Gold Production:

  Current estimates are based on royalty payments. However, that

which is used within Yukon is not subject to royalty. Also there are various estimates of gold which is hoarded for future years in anticipation of higher prices and also of undeclared gold. Even if royalty payments on hoarded gold are made, there is still a problem with identifying total production in any one year. A better system of obtaining gold production data is necessary. In conjunction with this, the mining of other minerals such as silver, Tungston and tin as a big-product of gold minings should be identified.

. Revenue per Operation:

Closely associated with gold production is information on revenue per operation. This data is very important because it will permit estimates of profitability. This is critical to a proper identification of impacts on the industry from potential regulatory changes. This is likely to be the most sensitive item of information that there is to generate. The methods of obtaining this data, under any of the alternate methodologies, must be thoroughly reviewed with the associations and total confidentiality must be guaranteed. It is absolutely essential that the image of a "Revenue Canada Witch Hunt" not be associated with the data collection. There is the potential for a possible concession in this area, if the primary objective of the royalty payment is to account for gold production, and since it is an insignificant revenue generator, then the royalty could be phased out entirely and replaced with this new system which would impose no cost on the operator.

. Total Number of Active Operators:

This data is obtained largely through the water use licenses and through inspections by water management officers (WMO). Again the estimates vary and there are differences of opinion on what to include and not include as an active operation.

Water use licenses by themselves are not an indication of operations since one operator can have more than one license and a license does not imply activity. Through "methodology A" an accurate count of operations would be obtained. Through the other two, estimates would continue to be necessary. The data that is required is the number of active operators (Those who are commercially active) and the number of operations they have in any one season, along with the characteristics of each operation.

. Employment:

This data is available through the observations of the WRO when on inspection. They can only provide a count of people on the job at the time of inspection. The counts do not account for variations over the season nor for actual man hours of work per employee. Total man years of work generated directly by the industry, for both the hired help and the owner/operators, is required for the analyses. Under methodology A, this would be obtained with complete accuracy. Under B and C it would be accurate for the responding operators but would require extrapolation to the total industry.

. Incomes:

There are several components to income. They include incomes paid to employees, management incomes, and profits. In composite these represent the total "Value Added" in production by the industry. The employee and management data can be obtained directly from the operators. Profits would be estimated as the residual of revenues minus all operating expenses for a given year.1.

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1. It is important that the revenue count for any one year include all of the gold produced in that year regardless of whether it is sold or not. Hoarding in anticipation of price changes is simply a form of saving income already earned.

. Equipment Investment:

This should include information on the type of equipment currently being used in the operation;

- type of equipment
- when bought
- at what price
- source of purchase.

It should include all types of equipment, large and small, and sundry items such as tools. The latter can be grouped. This information will be useful in developing a comprehensive business profile of various types of individual operations. It can then be used in estimating the value of lost investment from regulatory changes which seriously curtail or force closure of operations. It will only be necessary to obtain the historical from each operator in the first year of response or operation. After only replacement and new additions to capital need be obtained.

. Historical Investment:

This will include information on the total investment that is required to develop the property to prepare it for mining. The characteristics and use of this data are similar to that described for equipment investment. It is expected that the accuracy and availability of this information will vary greatly amongst operations. Also the type and level of investment will show considerable variance.

This data will also be useful in identification of total investment requirements for various types of placer mining operations.

. Non-Labour Annual Operation and Maintenance Data:

This should include all expenditures broken down into sufficiently broad categories as follows:

i) equipment service and repair
ii) fuel (all types including electricity)
iii) transportation (all forms, trucking, hauling, busing, air freight; all contracted transportation expenses)
iv) food and other camp supplies
v) legal, accounting, licences, fees, insurance, etc.
vi) other contracted work e.g. construction
vii) other (specified).

For each of the above categories, the specific information requested should include level and source of expenditure for the year with a financial breakdown for Yukon, other Canada, and outside Canada.

This data is required to identify the linkages and the spillovers from the placer mining industry to the other sectors of the economy. Due to the dynamic nature of the industry, it will be preferable to collect the information on an annual basis or at least once every two years.

It is quite likely that many of the operators do not currently keep records which would provide this breakdown. Again it is suggested that a very specific and simple record keeping system be set up and that the operators be taught, assisted and encouraged to adopt the system. This should serve to benefit the industry and individual operators in the long run.

. Off-Site Residence:

This involves an indication of where the operator maintains a residence particularly off-season. The information can be used to estimate the proportion of management and profit income that is spent outside Yukon and where income taxes are paid.

The same residence identification and leakage assessment would be done for the employees of the mine operation.

2.2.3 Summary

The following data/methodology table lists the required industry economic data elements and assesses the effectiveness of each data collection alternative; A, B and C, in collecting these. The methodology rating system which is utilized is as follows:

1. Very effective, total data, no extrapolation required;
2. Will likely contain a small margin of error, but is relatively accurate;
3. Accurate data but extrapolation required;
4. Will have a small margin of error, extrapolation will be required;
5. Will include a relatively large margin of error but it will be identifiable;
6. Will contain significant error and bias which will make use of the data tenuous.

Table 2

DATA/METHODOLOGY TABLE

DATA ELEMENTS	COLLECTION FRAMEWORK		
	A	B	C
. Gold production	2	4	6
. Revenue per operation	2	4	6
. Active operators	1	3	3
. Employment	1	3	3
. Equipment investment	1	3	4
. Historical investment	5	5	6
. Non-labour operation and maintenance	1	3	4
. Off-site residence	1	3	3

The above tabular comparison of the alternate data collection methodologies demonstrates that alternative A; the establishment of a placer mining agency, is considerably superior to the other two as a means of collecting the required industry data. It also has considerable other advantages in that it serves to bring the industry and government together in a joint effort and acts as an agency of referral and assistance which the industry has been requesting.

3.0 METHODOLOGY FOR COSTING REGULATORY CHANGES

To review the regulations that are presently being applied, the general water use licence, used by the Yukon Territory Water Board (YTWB) and two individual licences were obtained. They were reviewed to find all conditions that impose costs on the operators from the existing regulations. Each condition was then reviewed individually and a method for arriving at the cost each developed. It must be made clear that existing regulations do not bear incremental costs, since these are for current requirements. However, this assessment is justified since the data required to assess the cost of attaining new potential regulations will in large part likely be the same data that would be required to cost current regulations.

It is apparent from the outset of the exercise that costing can not be done for the industry as a whole because of the many site specific considerations necessary. It is also apparent that if the industry is to comply with the licences, to the letter of the law, money would have to be spent on engineering design of many structures. This at present is rarely done and compliance with the engineering criteria are determined by DIAND staff.

The following then are some of the components that have associated costs in adhering to present water licences. These costs have to be determined before one can determine incremental costs for new regulations.

3.1 Fish Screens

Fish screens are not required on all licences. Where they are required no standard for intake openings are specified but it is assumed they can be obtained from Fisheries and Oceans (DFO). The information to cost fish screens depends on the size of the pump, or intake structure and the manpower necessary for cleaning. The latter cost would be relatively stable at approximately one (1)

hour per day. The former cost would depend on materials used and construction costs.

Information required to cost fish screens:

a) Size of pump
b) Design criteria from DFO
c) Material costs based on above
d) Construction costs
e) Manpower costs @ 1 hr/day of operation, x operating days.

3.2 Control Structures for Intakes

Although this is a general condition of licences it is assumed that they would be required in a general operating schedule and therefore would not present an additional cost.

3.3 Flood Design

To design facilities for withstanding flood flow, the operator must know what that flow is and the level of flood protection. For most Yukon placer mining areas the data is available from DIAND. For areas where data is not available, the flood flows would have to be obtained or estimated. For example, designing to the 1:5 flood flow would mean constructing facilities to a significantly higher standard than is the present practice and would require an engineer's input to ensure compliance. In addition this design is site specific and no designs could be applied to the industry as a whole.

Information required for 1:5 Flow Design:

a) Design flows (possibly available, if not hydrologists estimates)
b) Construction costs

3.4 Settleable Solids Objective of 0.2 ml/l

The design criteria suggested by Weagle (1984) to meet the 0.2 ml/l

settleable solids objective was a loading rate of 1877 Igpm/acre. He also recommended that the length:width ratio for settling ponds be no less than 3:1. From these two criteria the surface area (length and width) of a settling pond can be obtained to meet the objective if the flow into the pond is known. Other information that must be considered in designing ponds is the storage of settled material and therefore the volume of sluiced material for the season, as well as the particle size distribution of the pay dirt. This last information will give an estimate of the depth needed in the pond for storage.

The final consideration in pond design is the topography of the valley where the pond is to be built. Water uses of 2,000 Igpm would require a pond surface area of approximately 1.06 acres or dimensions of 372 feet by 124 feet. This means that there must be a location on the property where a pond of at least these dimensions could be built. In actual fact the pond would have to be larger because of the need for sediment storage.

Information required for settleable solids objective:

a) Water flow to pond
b) Volume of sluiced material
c) Particle size distribution in pay
d) Valley topography in area of pond (including valley width and gradient)
e) Construction costs.

3.5 Suspended Solids

Weagle (1984) provides a methodology for predicting suspended solid levels in placer mining settling ponds. If the water use licences include S.S levels then this methodology would have to be employed to calculate the size of ponds necessary to reach the S.S level in the licence. The basic information needed to design these ponds are the same as for settleable solids with the addition of

yards/hr. sluiced. Again the same considerations must be given in pond design for sediment storage and valley topography.

Information required in order to meet specific suspended solids level:

a) Flows to pond
b) Production rate/hr
c) Volume of materials sluiced/year
d) Particle size distribution in pay
e) Valley topography
f) Construction costs.

Some of this data such as volume sluiced could only be provided in a very rough estimate.

3.6 Security

During the 1983 Public Hearings on Placer Mining Guidelines considerable evidence was given on the availability of security bonds for placer mining operators. The hearings concluded that in general bonds for this purpose would be very difficult to obtain for most placer miners because of the size of the operators and the vagueness of the purpose of the bond. Therefore the only cost that can be attributable to this condition is an actual cash bond put up by the operator. A possibility would be for the agency to act as a broker for the reclaimation bonds.

3.7 Fish Passage

The provision of fish passage for placer miners is site specific. Where creeks are large, costs are generally nil or low. Where creeks are small costs may be very high (greater than $400,000) and the water required for fish passage may actually reduce that available for mining thus reducing the viability of the mine. In addition the fish passage facilities must be built to the flood flow standard.

Information requirements for fish passage:

a) Fish species of concern
b) Minimum flow requirements
c) Flood design criteria
d) Valley topography
e) Construction costs

3.8 Stockpiling Overburden, Leveling off Tailings

These two items are considered to fall within the same category of materials management. The costs can be roughly estimated by knowing materials volumes, distances to be moved and available equipment.

Information requirements:
a) Volume of overburden to be moved
b) Volume of tailings to be moved
c) Moving distances
d) Type of equipment available.

3.9 Monitoring and Reporting

The monitoring required in the licences includes weekly water volumes and/or suspended and settleable solids. For the purposes of this study it is assumed the water volume data will add no cost to the operation.

The measurement of settleable solids will require approximately 3 hr/week of staff time and an IWMF cove costing $30. Suspended solids analysis will require analytical costs of $7/sample and shipping costs. The time to take the samples would be the same for settleable solids. The preparation of the monthly report will require approximately 4 hours of the operation time. Furthermore operators will have to be educated on sampling techniques.

Information required for monitoring and reporting costs:
a) Number of suspended solids samples x $7

b) Shipping costs

c) Weeks of operation per year.

3.10 Information Requirements for Costing the Conditions in Standard Water Use Licences

The following is a list of information required for costing the conditions in a standard water use licence. It was found that present water licences can be broken down into three general levels of requirements. The costs will vary with catagory as well as with the size of operation within the catagory. At present we do not have a cost for the present requirements. If by using a series of catagories and sizes these are determined, we could establish a present cost for environmental requirements.

The biggest problem at present is a reliable method for estimating the effluent quality from settling ponds. This problem was addressed by Weagle (1984) but his methodologies must be refined before accurate predictions can be made.

The required data is as follows:

i) Operational Data:

- Creek location
- Yards per hour sluiced
- Annual yards sluiced
- Water use
- Equipment operating costs
- Particle size analysis of pay dirt
- Flow to ponds
- Volume of overburden to be moved
- Volume of tailings generated
- Size of pumps used
- Equipment on site

ii) Physical Data:

- Valley topography
- Flow reqime for creek (stage duration curve)

iii) Biological Data:

- Fish species present in creek.

3.11 Incremental Costs of New Guidelines

The incremental costs of potential new guidelines can only be determined after the present baseline costs are established and a reliable method for determining effluent quality is developed. It is assumed however that the information requirements outlined above will be similar for incremental costs. Assuming that new guidelines will be more complex and demanding, the additional costs of engineering design of some structures will have to be included; these costs may be site specific and therefore difficult to apply to the industry as a whole.

3.12 Summary

As can be seen from the above discussion, the data and information requirements for costing out the implementation of regulatory changes is very considerable. The requirements are also site specific in many cases. Some work on costing could possibly be done in a manner to make it generally applicable to catagories of operations.

To do this it would be necessary to experiment on a specific site and also to develop a categorization of types and sizes of mine operations. This might require a large number of categories each having a relatively broad interpretation.

Before a decision is made to obtain all of the data that is necessary to cost the attainment of regulatory changes, it is important to look at how expensive this data collection will be and how accurate and reliable the information can be once obtained. For many of the specified data elements, the costs would be considerable and in addition there is no good method of measure (e.g. yards of dirt moved) utilized by all operators to make the data accurate.

4.0 RELATED SECTORS DATA

The placer mining industry is intricately related to various economic sectors. The linkages and relationships to the various sectors should be properly specified in order to determine the impact of the industry on the economy. The existence of a good Input-Output table would go a long way in aiding with this identification although it does not totally remove the need to further define some of the relationships; e.g. mining and tourism.

The various sector relationships which need to be reviewed include the following:

i) equipment dealers, parts, servicing
ii) fuel suppliers
iii) tourism
iv) transportation
v) government
vi) legal and accounting
vii) food and beverage
viii) forward gold processing linkages.

4.1 Data Collection

The method of data collection for all of these should be done as described below:

i) Carefully designed questionnaires aimed at obtaining a good level of information but again emphasizing practicality in collection and a definite purpose for the data.

ii) The questionnaires should be personally administered by specially trained individuals. This will assure better quality information and a representative response which would not be possible with a mail survey.

iii) Selective and very extensive sampling in each sector. In other words, sectors where the total sample universe is relatively small, should be done on a census basis. If the universe is larger but still relatively small the sampling

should be selective and the survey conducted through personal interviews. Where the universe is quite large, a random approach can be utilized. Given the relative small number of businesses in Yukon for any one sector, it is preferable to sample the universe or a large percentage of the universe on a selective basis to assure the collection of representative data.

iv) Responsibility for the data collection should rest with one department such as the Yukon Department of Mines and Small Business. The data storage and retrieval system should be the same as for the industry data. The SAS system currently in Economic Development would be quite good for this.

v) The frequency for collection of this data will vary from sector to sector and will also be determined by general economic and industry changes. Updates may not be necessary more than once every five years, unless there are significant structural changes in the economy.

4.2 Data Requirements

The following describe some of the required data and unique characteristics of each of the above specified sectors which comprise this data set. It must be noted that they are the sectors which relate directly to the industry and only those which are considered the most significant. The other item worthy of note is that this approach is only geared to obtaining information on the direct impacts and linkages with the placer mining industry. Indirect and induced effects would only be determined through other methods such as Type II multipliers from an I-O table.

i) Equipment, Parts, Service:

The sample frame should include all Yukon based dealers of equipment to the placer mining industry and all those who supply parts and provide servicing. This would include

equipment dealers, hardware stores, other parts dealers and equipment service outlets. The information items which should comprise the questionnaire are as follows:

. type and location of business;
. specify business functions e.g. i) sales, ii) service, iii) parts;
. equipment and parts sales;
  - type of equipment sold
  - for last calendar year value of equipment sold or leased, and type to placer mining operators
  - historical sales data (as available)
  - percentage of total sales attributable to the industry
  - total employment
  - salaries paid out over the year
. service;
  - type of servicing provided
  - for last calendar year total value of servicing to the placer mining industry
  - total employment
  - percentage of business devoted to placer mining
  - salaries paid

ii) Fuel Suppliers:

The sample frame should include all bulk sale dealers who supply to placer miners. The information requested will include the following:

- type and location of business
- volume and value of total sales to the industry
- percentage of sales attributable to the industry
- total employment
- salaries paid over the year

iii) Transportation:

Parts of the transportation industry serve placer mining. Examples include shippers and haulers. To identify the linkages between the two sectors and the significance of placer mining business to the transportation industry, a survey is necessary. The type of data that needs to be collected are the same as specified above.

iv) Food and Beverage:

Food and beverage wholesalers, and retailers to some extent, will be providing supplies to the camps during the mining season. Their identification will be necessary followed by a survey to identify the linkages and the significance.

v) Legal and Accounting:

Similar to other sectors there will be some linkages in this sector. The sampling should be done on a selective basis to specify the linkages.

vi) Government:

A portion of government employment and revenues will be directly attributable to the placer mining industry. The departments where this employment is found will have to be surveyed to identify the total employment that is directly attributable to the industry and the value of wages paid. This will be done at Federal, Territorial and municipal Government levels.

vii) Processing:

The placer mining industry is directly linked to forward processing in the form of goldsmith operations in Yukon. A survey will be necessary to specify the linkages and determine the economic significance.

viii) Tourism:

The tourism industry is very intimately linked to placer mining. It is also a very important contributor to the Yukon economy. The direct linkages and the significance of the tourism industry to placer mining need to be established.

There are two potential possibilities for linkage or impact; placer mining activity may take away from the value of the tourism experience for those who come to Yukon to enjoy the pristine wilderness experience and are turned off by the environmental disruption. The other linkage is a positive one whereby part of the Yukon charm which attracts visitors is the romance and history of the Klondike. The visitor activities and portions of their expenditure may then be directly tied to placer mining activity.

In order to determine both the positive and negative impacts of the industry on tourism, it is necessary first to have an accurate count of visitors to Yukon. At this point in time, the Yukon tourist estimates likely contain a significant and unspecified margin of error. There are some very good methodologies developed for doing relatively accurate visitor counts. These can also specify modes of travel and other visitor characteristics.

It will also be necessary to obtain representative survey data on expenditures in total and by various expenditure categories and locations of activity and expenditure. In addition information will be required on rotivational factors and preferences. Specifically this should address questions which deal with why people come to Yukon, what attracts them, and their impression and reactions to the placer mining industry.

A survey of tourism facility operators, done on a selective representative sample basis, would also serve to provide very useful information with respect to attitudes, preferences, activities and direct linkages to the placer mining industry.

This information would then be used to specify the linkages and economic impacts both positive and negative which placer mining has on the tourism sector. This data base would only need to be updated occasionally, such as once every five years.

5.0 BENEFITS

An identification of benefits from a stream classification system and from the implementation of potential regulatory changes on the placer mining industry answers the question, "For what purpose?" In other words why is this being done?

The measurement of tangible benefits from the implementation of new regulations is very difficult because the benefits are not very tangible, not easily measured and often difficult to identify. There is one primary area of tangible benefits and that is the fishery associated with rehabilitated fish populations and fish habitat. Another area of potential benefits is tourism. As previously mentioned, care must be taken with tourism because there is also a cost aspect which must be considered.

It is recognized that there are other areas of potential benefit. These include such things as wildlife rehabilitation, maintenance of forest cover and other vegetation and the value of a natural landscape. In the context of placer mining activities, these are of an environmental nature, and highly intangible in that economic values can not reasonably be imputed. As previously suggested, they should be treated in an environmental evaluation and not form part of economic analysis since their values are better described in non-economic terms.

5.1 Fisheries

Fisheries are the primary potential tangible beneficiary of a stream classification system and the implementation of new placer mining regulatory changes. In fact the proposed guidelines were largely designed to protect and rehabilitate the fish population and fish habitats. It is important to draw a distinction between fish rehabilitation and fishery. Fishery implies the activity of harvesting fish. This has a measurable economic value whether it be sport, domestic or commercial.

Fish population and habitat rehabilitation are largely intangable and are more comparable to other intangible factors of an environmental nature. They can also have future value from a fishery viewpoint. However, This is largely unmeasurable and would likely result in a very low present value.

It must be realized that an economic measure of an improved fishery is very difficult to identify. Several attempts were made with providing a measure of the increased value of the fishery with the implementation of proposed placer mining guidelines. These were mostly done in conjunction with the public hearings. The values derived vary considerably, they are based on extremely poor base data and the methodological assumptions are often questionable. The results are therefore very suspect and contain a very wide margin of error.

The base data requirements to conduct successfully an economic assessment of an improved fishery from potential placer regulatory changes, make it very difficult to do well. The data base requirements which would enable more precise measures than was done historically are as follows:

i) An accurate estimate of fish species and populations in the streams where placer mining activity now occurs;

ii) An accurate assessment of the extent of protection and rehabilitation as a result of new placer mining guidelines i.e. how many more fish, of what species, in which location?

iii) The proportion of these that would be harvested in Yukon. i.e. changes in the fishery.

The above specified data are currently not available or if so in a very poor form or incomplete. The data on fish species and populations is the responsibility of The Department of Fisheries and Oceans. They are currently available only for a small number of areas and often not in much detail and not based on a lot of research.

In order to do an economic assessment or even a thorough impact assessment on the fishery from placer mining this data is necessary. It is anticipated that this would be a very major and costly study effort.

Similar to that described above, estimates of fish habitat rehabilitation from potential placer mining regulatory changes are necessary to calculate the tangible economic values and also do a proper environmental evaluation. This work should be the responsibility of the Department of Fisheries and Oceans if there is a potential economic benefit to be realized from fishery rehabilitation.

6.0 BIBLIOGRAPHIC DATA BASE AND COMPLEMENTARY LIBRARY

It is recommended that both a bibliographic data base listing works dealing with placer mining and a library containing as many of these works as possible be established. At present there is neither such a bibliography nor a single library containing even all the current reports on placer mining. The sections which follow point out the major factors to be considered and decisions to be made in proceeding with either of these projects.

6.1 Bibliographic Data Base

6.1.1 Scope

a) Subjects to be covered:

It is suggested that the data base include:

i) Materials specifically dealing with the following topics in the Yukon:

- placer mining, including geology and mining techniques
- studies of fisheries, water quality, wildlife, revegetation, recreation, tourism, in placer mining areas.

ii) Studies of B.C. and Alaskan placer mining issues deemed to be relevant for the Yukon, e.g. treatment of placer mining water effluent, revegetation studies, the effects of placer mining effluent on fish, etc.

iii) Studies on reclamation, revegetation, effects of suspended solids on fish, etc., which while not conducted in the Yukon are deemed to be relevant to the Yukon situation.

b) Formats:

Material in the following formats should be considered for inclusion:

i) Reports;

ii) Articles in scholarly journals;

iii) Articles in newspapers and popular magazines;

iv) Files maintained by Yukon and federal government agencies;

v) Machine readable data bases;

vi) Maps;

vii) Audio-visual materials.

6.1.2 Information to be Included for Each Item

The following information should be provided for each item: author; title; publisher/issuing agency; place and date of publication; physical description; series; contract number, if any; notes; descriptors or subject headings; call number; location; other special notes as required; and contact person (where applicable).

6.1.3 Data Base Production Systems

a) It is recommended that the data base be automated in order to provide for:
   - ease of updating
   - capability of providing outside agencies with copies of a catalogue
   - capability of producing specialized bibliographies of items within the data base which meet specified criteria.

b) It is recommended that the data base be available for on-line searching and provide for production of a printed catalogue?

c) It is recommended that the catologue be in card format rather than book format because a catalogue cannot be kept up-to-date as readily as a card catalogue (a card catalogue can be updated by simply filing a new batch of cards in it while the entire book catalogue must be reprinted in order to include the most current cataloguing in it) this has to be balanced against the following advantages of a book catalogue:
   i) less manpower is required to up-date it (there is no filing and removal of catalogue cards to contend with;
   ii) copies can be made available to other agencies;

iii) the data base can be searched on-line by those having access to the computer on which it is mounted.

d) Desirable characteristics of a program:

i) It must permit flexibility of record design, providing for an adequate number of elements which should either be unlimited in length or of an adequate length, e.g. 750 characters for the subject heading element. At least the author, title, publisher/issuing agency, series, subject heading and call number elements should be indexed;

ii) It should provide for printed catalogues, preferably with user-defined formats. There should be at least two catalogues, one containing name-title-subject entries in one alphabetical sequence and a shelf list with the records organized in call number order;

iii) It should permit the use of see and see also references;

iv) It should allow for the preparation of on-demand bibliographies on specific topics, preferably allowing for the boolean logic;

v) It should permit the user to define formats for special purpose applications.

6.1.4 Subject Headings and Classification System

Existing standard and other specialized systems should be evaluated for their suitability for organizing the collection. The decision as to which subject heading and classification system to use will depend in part on the location of the complementary library.

The level of subject indexing desired must be determined. If useful data on water quality, fisheries, etc. in site specific reports is to be indexed so as to provide access to it by both type of data and geographic area, the feasibility of incorporating this indexing in the bibliographic data base must be evaluated.

6.1.5 Creation of the Data Base

Once the scope of the data base both in terms of the subject matter and format of materials is determined, relevant bibliographies and data bases must be searched to locate materials to be included in it. No materials should be entered unless the compiler can at least borrow a copy of the item and have it physically in hand to prepare the record for entry into the system.

6.1.6 Maintenance of the Data Base

In order to keep the data base, and the collection, up-to-date, regular searches should be made of the sources used in establishing the data base. Close liaison should be maintained with other agencies concerned with placer mining (e.g. the Mineral Industry Research Laboratory at the University of Alaska, Fairbanks) and with all Yukon and federal government departments identified as being involved in placer mining. It is recommended all government contracts which will result in the preparation of a report include the condition that one copy of the report be submitted for inclusion in the data base and library.

The specific design of the data base has not been done for this Study. The main reason for this is that it was felt premature to do because at this point in time policy decisions have to be made which will affect the design of the data base. These decisions deal with the frameworks for data collection, who will assume responsibility, the extent of collection, and the hardware for storage. This in turn will affect the specific data collection methodologies, the data elements and the storage and retrieval system. The data base design should only be done after all of the above critical decisions are made.

6.2 The Library

6.2.1 Administrative Matters

The possibilities for administration of the library include the following:

a) It could be associated with the recommended placer mining agency.
b) It could be associated with the Mines and Small Business Departmental library either as a physically separate collection or integrated with other materials.
c) It could be associated with the proposed Placer Mining and Technology Institute.

It is recommended that the library be with the agency as a first choice or with the institute if the agency is not formed.

6.2.2 Scope of the Collection

If it is not to match the scope of the materials to be included in the data base, the variances must be defined and recorded.

6.2.3 Services to be Provided

The services to be provided by the library and the basis on which they are to be provided must be defined. It is recommended that the collection be open to the public. If staffing considerations preclude direct loans to all interested parties, it is recommended that materials be lent directly to the client group of the supervising agency and to other interested individuals via inter-library loans.

APPENDIX

PLACER MINING DATA INVENTORY

PLACER MINING DATA INVENTORY

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A. METHODOLOGY

The following methods were used to locate information listed in this inventory:

1) The Yukon Bibliography computerized data base was searched for all items given the keyword "placer".

2) The Boreal Institute for Northern Studies Library's computerized data base was searched for all items assigned the classification code for placer mining.

3) The Boreal Institute for Northern Studies Library's card catalogue was searched manually for works dealing with Yukon.

4) The bibliographies of reports prepared in response to the 1983 placer mining guidelines and other current studies were searched for references to relevant works

5) During individual meetings with each of the Study Committee members, their assistance in locating relevant reports and providing information on data sources was solicited. In addition, members of the Yukon government's Heritage Branch and Tourism Branch and the federal government's Mineral Rights Division, Exploration and Geological Services and Mining Claims Inspection Branch were contacted.

6) Other sources such as catalogues of University of Alberta Libraries and Statistics Canada catalogues were checked.

The assistance of members of the Study Committee, other Yukon and federal government officials, and Robin Minion and Nita Cooke of the Boreal Institute for Northern Studies Library is gratefully acknowledged.

Considerable effort was expended in trying to physically locate all the materials listed; however, this was not possible.

B. SCOPE

i. Subjects Covered

This inventory of reports and data sources on the placer mining industry concentrates on materials which deal with:

the placer mining industry in general and its significance to the Yukon economy

existing and proposed regulatory regimes and their environmental and economic implications

water quality and fisheries data including the economic significance of the fishery to the Yukon.

Some current Alaskan studies on the treatment of effluent water from placer mining operations, and on the environmental and economic aspects of the Alaskan placer mining industry have been included.

Though it is recognized that placer mining operations have a potential impact on any component of the Yukon natural resource base located in the same area as the mine site or downstream from it, reports on resources potentially impacted by placer mining operations are listed only if they deal specifically with the relationship between placer mining and the resource. As there is neither a comprehensive index to the existing separate reports and files to enable one to locate those dealing with a specific geographic area, e.g., a placer mining claim, nor a massive set of integrated computer searchable data resource files, it was not possible to locate and include all natural resource data which might have a bearing on placer mined areas. In the Yukon Resources Information System Study Project, Tomlinson recommended the establishment of a Yukon Resources Data Unit to develop and maintain a Yukon Resources Information System; implementation of his proposal would enable one to locate such data. General bibliographies and map sets covering Yukon's natural resources are noted in Section 1, Part A of the inventory.

ii. Types of Material

Reports, both published and unpublished, and data files are listed. Periodical articles and newspaper articles are not listed. Those interested in the latter are advised to search the computerized listing Northern Titles produced by the Boreal Institute for Northern Studies Library in Edmonton. Those interested in scholarly periodical and journal articles will need to check a the indexing and abstracting services relevant for their particular field of interest.

C. ORGANIZATION OF ENTRIES

The inventory is organized in two main sections: Section 1, which is a listing of reports and data files arranged by subject and Section 2 which provides a fuller description of unpublished data files.

Section 1

Within Section 1, scope notes on the range of materials listed on specific subjects are provided where appropriate. Entries are arranged by author or issuing agency in all subsections except subsection B.3 Legislation, regulations and guidelines; here they have been arranged by date of publication.

Brief descriptive annotations are included for most reports. Where the annotation has been derived from a source other than the report itself, the source has been noted.

A few reports which were neither located physically nor in annotated bibliographies have been listed. In these cases, the bibliography in which they were located has been noted.

Section 2
All items listed in Section 2 are also briefly listed in Section 1 with a cross reference directing the user to the relevant entry number in Section 2 for more detailed information. In Section 2, entries are listed by source department then by title.

A title index has been provided in Section 4 to assist the user trying to locate a particular report.

D. KEY TO ABBREVIATIONS

BIN Boreal Insitute for Northern Studies. Library catalogue.

COIN COIN; a directory of computerized information in Canada. 5th ed. Edmonton: Alberta Research Council. Industrial Engineering and Research Division, 1984. 561 p.

Ennis Ennis, G.L. et al. Annotated bibliography and information summary on the fisheries resources of the Yukon River Basin... See item 109.

Fox Fox, Irving K. et al. Yukon water resources management policy and insitutional issues... See item 78.

SEIA Canada. Environmental Protection Service. Environmental Strategies Directorate; Canada. Dept. of Indian Affairs and Northern Development; and Canadian Resourcecon Ltd. Socioeconomic impact analysis of draft guidelines for the Yukon Placer Mining industry. See item 57.

Shannon Shannon & Wilson, Inc. Placer mining wastewater treatment technology report: Literature review. See item 103.

Singleton Singleton, G.A. et al. Fish and wildlife habitat recovery in placer mined areas of the Yukon... See item 141.

YPMGPRC Yukon Placer Mining Guidelines Public Review Committee. Resources, regulations & reality; report... See item 54.

YUK Yukon bibliography machine-readable bibliographic data base. See item 6.

A. GENERAL NATURAL RESOURCE INFORMATION

1. BIBLIOGRAPHIES AND MAPS

1. Boreal Institute for Northern Studies Library. Northern titles. Edmonton: The Library, 1971 - . monthly.
   A keyword index to articles in northern newspapers, journal articles, government documents and other ephemera received by the Library. Available in hardcopy on a subscription basis. Indexing from 1972 on can be searched online under the title Boreal Northern titles through QL systems.

2. Canada. Dept. of Indian Affairs and Northern Development and Canada. Dept. of the Environment. Land use information series [maps]. Ottawa: 1972-1976. Maps at a scale of 1:250,000.
   Maps include information on wildlife, fish resources, native land use, ecological land classification and socio-economic and cultural data such as archaeological and historic sites. Maps for the Mackenzie valley - North Yukon were originally issued in 1972 with the majority being updated in 1976; maps for South and West Yukon were issued in 1973 and those for MacKenzie and Selwyn Mountains in 1974.

3. F.F. Slaney & Co. Ltd. Yukon land and resource inventory: bibliographic index. Prepared for the Yukon Government. 1979. 1v.
   Contains references to over 3,000 published and unpublished studies arranged in 23 subject categories. Within each subject category, entries are arranged by an arbitrarily assigned number not by author, date of publication or title; this makes it difficult to use this work as a bibliography. Where relevant, each reference includes the NTS map sheet number and the latitude and longitude of the area studied.

4. F.F. Slaney & Co. Ltd. Yukon land resource and inventory atlas. Whitehorse: Government of the Yukon, 1979. 3 v.
   Maps information on 23 subjects, including hydrology, economic minerals and fisheries, at the 1:250,000 scale. Bibliographic references to mapped and unmapped studies are listed on each map sheet.

5. Tomlinson Associates. Directory of data types and sources in the Yukon. Ottawa: 1981. 2 v.
   A subject arranged listing which provides the following information for each data source: contents, geographic reference, record format, data volume, source, contact/repository, and, in some cases, comments.

6. Yukon bibliography. 1964 - . Currently published by the Boreal Institute for Northern Studies Library based in Edmonton.
   The first edition of the Yukon bibliography was compiled by J.R. Lotz and published in 1964 by the federal department of Northern Affairs and Natural Resources. The Library of the Boreal Institute for Northern Studies published the first

update covering the period 1963 - 1970 in 1973. Seven updates have been published to date; since 1979, these have been issued annually. Cumulative subject and author indexes to 1980 have also been published.
Covers all subjects relating to the Yukon. Entries are arranged by subject, e.g., economic development, geology, history, hydrology, wildlife, etc. Author and subject indexes are also provided in each edition. Information included from 1971 on is also available for on-line searching through QL Systems.

7. Yukon. Dept. of Renewable Resources. Lands, Parks and Resources. Natural features habitat inventory. [Machine-readable data base]
Established in May 1984 to identify, locate and briefly describe significant unique and respresentative natural features of the Yukon. (Introduction to the Yukon natural features inventory manual, 2nd draft, Feb. 1985). Determination of what constitutes a natural feature is subjective; includes such features as calving areas. Each feature is located on 1:250,000 NTS maps for the Yukon. The data base, which is a SAS file on the Yukon Government computer, contains about 300 records. It is available for on-line searching; contact person is Karen McKenna.

B. PLACER MINING AND RELATED ISSUES

1. GENERAL

The following section contains general reports on placer mining. Though there was some interest among Committee members in seeing publications on the geology of placer deposits and placer mining technology included, it was not feasible to do so. Only one report on the geology of the deposits has been included; the annual Yukon exploration and geology. Some of the sources which can be consulted by those interested in pursuing this topic further are listed below.

1.i. BIBLIOGRAPHIES AND MAPS

8. Canada. Northern Affairs Program. Mineral Rights Division. Mining claims maps. Whitehorse.
Boundaries of claims and leases mapped at either 1:10,000 feet or 1:31,680. Mapping is based on the claim/leaseholders application and accompanying sketch. The Division is in the process of switching to a scale of 1:30,000. Updated continuously.

9. Debicki, R.L. "Bibliography of references pertaining to placer deposits, exploration and mining methods in Cordilleran and permafrost terrains," in her Yukon placer mining industry, 1978-1982, p. 184-196. See item 20.

10. Debicki, R.L. "References to placer creeks in Yukon," in her Yukon placer mining industry, 1978-1982, p. 170 - 183. See item 20.
Contains references to GSC publications issued between 1863 and 1968; Dept. of Indian and Northern Affairs publications issued from 1941-1959; and Dept. of Mines publications issued from 1874 to 1979.

11. GEOSCAN [Machine-readable bibliographic database]
Identifies and indexes published and unpublished geological and related documents dealing with the Canadian landmass and its offshore regions. For searches, contact the National Geoscan Centre, Geological Survey of Canada. (COIN)

12a. Mining technology database [Machine-readable bibliographic database]
Includes more than 24,000 abstracts of journal articles, technical reports and books on mining technology of interest to Canadians. Sponsored by CAN MET, access to the file is through QL Systems Ltd.

12b. Yukon Archives and Canada. Northern Affairs Program. Mining recorders records (placer) 1894-1972: finding aid. Whitehorse: 1983. 72 p. (Yukon Archives series; 10)
Guide to mining recorders records in the Yukon Archives. Records include applications for grants, renewal grants, royalty ledger books and water rights records books.

1.ii. GENERAL WORKS

13. Canada. Dept. of Indian Affairs and Northern Development. Exploration and Geological Services Division. Yukon exploration and geology. 1979/80 - . annual.
Issued 1979/80 and annually since 1981. Latest edition is 1983. 1979/80 had title Yukon geology and exploration. Includes a review of activities, technical reports, summaries of assessment work, description of mineral claims staked and mineral production figures. Continues Mineral industry report : Yukon Territory issued in the Geological Survey of Canada's Papers series from 1960 - 1968 and by DINA's Northern Economic Development Branch 1969 - 1978.

14. Canada. Northern Affairs Program. Mines and mineral activities. Ottawa: 1961? - . annual.
In the 1983 edition, the section on Yukon placer mining provides figures on gold declared for royalty payments, number of claims and leases, employment, information on some of the larger producers and an outlook for the coming year. Issues for 1961?-69 had title Mining in the North.

15. Canada. Northern Affairs Program. Yukon placer mining. Ottawa: 1985. 29 p., illus.
Intended to serve as a guide to those interested in placer mining. Contains information on mining techniques and relevant government regulations. Updates 1981 edition with the same title.

16. Canada. Northern Affairs Program. Northern Research and Economic Planning Branch. Mineral industry incentive programs and services. Ottawa: 1983. 41 p. (Northern Mineral Policy Series 8)
A brief listing of direct incentive programs and services available from DIAND, other federal departments and the territorial governments in the areas of exploration, development, exploitation and smelting and refining.

17. Cook, Donald J. Placer mining in Alaska. Fairbanks: University of Alaska. Mineral Industry Reseach Lab., June 1983. 157 p., illus., tables. (M.I.R.L. Report no. 65)
Includes information on the history of placer mining in Alaska, mining methods and recovery systems and environmental considerations.

18. Debicki, R.L. Placer mining industry in Yukon and Atlin mining division, B.C. Whitehorse: Canada. Dept. of Indian Affairs and Northern Development. Geology Section, 1983. 220 p., maps. (Yukon River Basin study project report. Placer no. 1)
Summarizes the history of placer mining in the Canadian portion of the Yukon River Basin and the regulations governing property acquisition, mining and stream rehabilitation in the Yukon, B.C., and Alaska. (BIN)

19. Debicki, R.L. editor and compiler. Yukon mineral industry, 1941 to 1959. Whitehorse?: Canada. Dept. of Indian Affairs and Northern Development, 1983. viii, 136 p., illus., tables.
Contains previously unpublished reports on the lode and placer mining industries. Includes information on claims, leases, operating dates, employment, production, etc. Compiled from information in the mining recorders reports; Comptroller's, or after 1948, Commissioner's reports; and government correspondence with mining companies. Overviews of the mineral industry were published as Memoirs of the Geological Survey of Canada from 1934 - 1940, and in Mineral industry report: Yukon Territory from 1960 - 1978. Currently they are published in Yukon exploration and geology issued by DIAND from 1979/80 - , see item 13.

20. Debicki, R.L., editor and compiler. Yukon placer mining industry 1978-1982. Ottawa: Canada. Northern Affairs Program. Exploration & Geological Services Division, 1983. 203 p., illus., maps.
Includes statistical reports on the placer mining industry, a review of relevant legislation and regulations, technical reports and descriptions of 288 individual mining operations active in the Yukon between 1978 and 1982. Includes a listing

of creeks on which baseline surveys have been done.

21. Gilbert, G.W. Brief history of placer mining in the Yukon. Whitehorse: Canada. Northern Affairs Program, 1980. 16 p., illus., map.
Reprinted in 1983. Includes a selected bibliography of relevant publications issued by the Geological Survey of Canada, other government agencies and trade publishers.

22. Gilbert, G.W. Notes on placer mining in the Yukon Territory. Whitehorse: Canada. Dept. of Indian and Northern Affairs. Office of the Regional Geologist, 1974. 13 p., map, tables.
Intended to serve as guide to new placer miners and prospectors.

23. Peters, Karin. A report on the Yukon placer mining industry. Vancouver: UBC Westwater Research Centre, 1981. (Fox, p.50)

24. University of British Columbia. Westwater Research Centre. "Placer mining in the Yukon," in Yukon Water Management: a Bulletin of the Westwater Research Centre, no. 2, Jan. 1982. 8p., illus.
Text is also published in Fox, Irving. Yukon water resources management policy and institutional issues, see item 78.

2. STATISTICAL AND OTHER DATA SOURCES

There is a lack of statistical data on the economic aspects of the placer mining industry. While one would hope to be able to locate production figures in Statistics Canada publications, as indicated in the notes for the titles listed below, they frequently either do not provide separate figures for placer production or combine placer production figures for Yukon and the Northwest Territories. The best source of information on placer gold production is Mines and minerals statistics issued by the federal Department of Indian Affairs and Northern Development. This data is reported in summary form in the quarterly Yukon economic review. These figures are not production figures but figures on the amount of gold on which the royalty export tax was paid.

The Mineral Policy Sector of the federal Department of Energy, Mines and Resources which assists Statistics Canada in the production of statistical publications related to the mining sector recognizes this gap. The Statistics Branch of the Yukon Dept. of Economic Development and Tourism was under the impression that a revised commodity schedule was sent to all placer miners holding water licences in 1984. However, the Mineral Policy Sector indicated that this schedule had not been recently revised and that it is now being sent only to the larger placer operators due to the poor response from smaller operators. As detailed reports are received from gold refiners, the department's statistician feels 95% of the refined output is being captured. (Communication from Ms. Sally Hamilton, Mineral

Economist, Regional Mineral Development, EMR, May 7, 1985)

Statistics Canada's Investment statistics: exploration, development, capital and repair expenditures by mining and exploration companies (61-216) sounds like a promising source of information on the costs of production. However, as it is based on questionnaires sent to 3,000 companies (not unincorporated operations) and does not provide figures by type of mining for each geographic area, it is of no assistance.

The reports of the Mining Claims inspectors, and the licence applications, monthly and annual reports submitted by miners to the Yukon Territory Water Board do provide some information on the number of employees, equipment used, volumes of earth moved, etc. These sources are listed below and described in Section 2, Description of Unpublished Data Sources, items F and K. In addition, the Water use inspection reports, see Section 2, item J, contain notes on equipment in some cases.

26. Canada. Statistics Canada. Canada's mineral production: preliminary estimate. Ottawa, 1927 - .annual. (Statistics Canada 26-202)
Provides gold production figures for the Yukon in grams and dollars. Does not distinguish between placer and non-placer gold production. Reviewed 1984 edition issued March 1985.

27. Canada. Statistics Canada. General review of the mineral industries: mines, quarries and oil wells. 1949 -. annual. (Statistics Canada 26-201)
Table 1 provides gold production figures in grams and dollars for Yukon but does not provide separate figures for placer gold production. Table 4 gives average annual metal prices in Canadian dollars. Reviewed 1982 edition issued Oct. 1984.

28. Canada. Statistics Canada. Jewellery and silverware industry. Ottawa: 1961- .annual (Statistics Canada 47-211)
Lists only 1 establishment in Yukon/NWT combined and provides no figures for production costs, cost of materials, value added, etc. Reviewed 1982 edition issued May 1984.

29. Canada. Statistics Canada. Metal mines. Ottawa: 1978- annual. (Statistics Canada 26-223)
Table 12 provides statistics on the weight and value of placer gold for the Yukon and NWT combined; table 1 reports only 4 operations in the combined territories and provides no figures for production costs, number of employees, etc. To 1978 a separate publication Placer gold mines, gold quartz mines & copper-gold-silver mines, 26-209, provided information on placer gold. Reviewed 1982 edition issued 1984.

30a. Canada. Dept. of Indian Affairs and Northern Development. Mines and minerals statistics. Ottawa: Sept.1982?- . monthly.
Contains the following information on the placer industry for each territory: mineral claims summary indicating claims by entry and by lease; payments under prospectors assistance program; revenues from sale of maps, etc.; summary of mining dispositions; summary of revenue - Yukon Mining Administration. Sections on each mining district then provide the following information: activity highlights; statement of royalty export tax paid indicating the date, receipt number, name of producer, origin of gold, ounces, export tax and royalty certificate number; details of claims applications submitted, recording and transfers; summary representation work submitted; mining progress report and summary of revenue.

30b. Canada. Northern Affairs Program. Mineral Rights Division. Mining claims records.
SEE SECTION 2 ITEM G FOR INFORMATION

31. Canada. Northern Affairs Program. Mining Claims Inspector's Office. Mining claims inspection reports.
SEE SECTION 2 ITEM F FOR INFORMATION

32. Emond, D.S., D.A. Downing, and J.A. Morin. 1984 Yukon mining and exploration overview. Whitehorse: Canada. Dept. of Indian Affairs and Northern Development. Exploration and Geololgical Services Division, 1985. [18] p., maps, charts.
Includes a summary of monthly statistics for Yukon as a whole and for each mining district indicating the number of placer claims and leases in good standing, raw gold declared for placer royalty export tax, number of placer leases and claims staked, quartz claims staked. Graphs indicate placer leases and claims staked and Yukon placer gold production and Yukon placer production as a percentage of Canadian production for the years 1971 - 1984. Preprint of a section to be published in Yukon exploration and geology 1984, see item 13.

33. Yukon. Dept. of Mines and Small Business. Statistical Services Branch. Yukon economic review. Whitehorse: 1978? - . quarterly.
Includes statistics in the following broad categories: population, employment, consumer prices, rental units, real estate, construction, resources, trade and transportation. Includes data on the production and value of gold and on petroleum products sales.

34. Yukon Territory Water Board. Water licence applications, licences, monthly and annual reports.
SEE SECTION 2 ITEM K FOR INFORMATION

3. LEGISLATION, REGULATIONS AND GUIDELINES

3.i. GENERAL

The items listed below are general in nature but have some application to the placer mining industry.

35. Canada. Dept. of Indian Affairs and Northern Development. Land use guidelines, mineral exploration: Yukon and Northwest Territories. Ottawa: 1983. 52 p., illus.
Contains a synthesis of techniques and guidelines for minimizing environmental damage during mineral exploration in Yukon and N.W.T. Includes information ranging from how to apply for a land use permit to proper procedures for abandoning a site. (BIN)

36. Canada. Northern Affairs Program. Northern natural resource development: requirements, procedures and legislation. Ottawa: 1981. 31 p.
Identifies the authorizations required and clarifies the procedures involved in Northern natural resource development.

3.ii.a. PLACER MINING - YUKON

The following items deal with regulation of the placer mining industry. In order to assist the user in gaining a historical perspective on the development of the regulatory regime which governs placer mining, these have been arranged in chronological order.

With a few exceptions, briefs presented to the Yukon Territory Water Board have not been listed. Consult the Water Board for these items.

See also item 15 for a general guide to regulations governing placer mining and items 90-92 and 112 for related fisheries and water quality reports.

37. Canada. [Northern Inland Waters Act.] Northern inland waters act, R.S.C. 1970, (1st supp.) c.28 as am. to S.C. 1977-78, c.20, s.42.

38. Canada. [Northern Inland Waters Act. Regulations.] Northern inland waters regulations, C.R.C. c.1234 as am. SOR/82-767, SOR/84-157.

39. Canada. [Territorial Lands Act. Regulations.] Territorial dredging regulations, SOR 54-668 as am. to P.C. 1955-1023.

40. Canada. [Yukon Placer Mining Act] Yukon placer mining act, R.S.C. 1970, c. Y-3 as am. by R.S.C. 1970, (1st supp.) c.49. Ottawa: Canda. Information Canada, 1972. 53 p.
Minor amendments subsequently made by S.C. 1972, c. 17, s.2 and S.C. 1976-77, c.30, s.40 are not included in this consolidation.

41. 1973 Brandon, Lionel. Summary of the applications for a water use licence for placer mining operations. Whitehorse: Canada. Dept. of Indian Affairs and Northern Development. Northern Natural Resources and Environment Branch, 1973? 13 p., illus., maps.
Designed to provide background information on water use in placer mining operations for those involved in the Nov. 1973 public hearings on water use in placer mining operations. Includes a list of applications for water use licences.

42. 1976 Yukon. Controller of Water Rights. Placer mining operating guidelines in regard to water use authorizations. March 23, 1976. (SEIA, p. 205)

43. 1977 Garinger, L.E. The regulation of water use in placer mining in the Yukon territory. 1977. 7 p.
Paper presented to the Alaska Miner's Association meeting in Anchorage, Oct. 28, 1977. Outlines the Canadian approach to placer mining control with particular reference to Yukon. (BIN)

44. 1977 Working Group on Water Quality Objectives. Guidelines for establishing water quality objectives for the territorial waters of the Yukon and Northwest Territories. Prepared for the Chairmen of the Water Boards of Yukon and Northwest Territories. Ottawa, 1977. viii, 47 p., tables.
Presents, in the best judgement of the Working Group, the quality of water required to support each of the uses defined in regulations to the Northern Inland Waters Act.

45. 1979 Yukon Territory Water Board. Interim guidelines for the issuance of authorizations to use water for the purpose of placer mining in the Yukon Territory. 1979.
Note: Transcripts of the public hearings held Sept. 7, Sept. 20 and Oct. 25, 1979 to discuss the guidelines are available.

46. 1981 Canada. Dept of Fisheries and Oceans and Canada. Dept of the Environment. Yukon placer mining: a position paper. 1981. 17 p.
The principles of and a suggested approach for the development of a revised administrative/regulatory framework for placer mining.

47. 1981 Yukon Chamber of Commerce and Klondike Placer Miners Association. Recommendations of the Yukon Chamber of Mines and the Klonkike Placer Miners Association to the Hon. John C. Munro, Minister of Indian and Northern Affairs. Whitehorse: Sept. 17, 1981. (SEIA, p. 211)

48. Ken Weagle Environmental Consultant. Rationale for the
1982 principles for placer mining industry guidelines in Yukon. Prepared for the KPMA. Whitehorse, 1982. 27 p.
Comments on the feasibility of the proposed guidelines. Includes tables summarizing data on fish captures and suspended solids as reported in the literature and a list of Yukon salmon spawning creeks and rivers.

49. Robinson, D.J. Government response to KPMA "10 principles".
1982 Whitehorse: Canada. Dept. of Indian and Northern Affairs. Northern Environment Branch, Oct. 1982. (SEIA, p. 210)

50. Canada. Dept of Indian Affairs and Northern Development,
1983 Canada. Dept of Fisheries and Oceans, and Canada. Dept. of the Environment. Yukon placer mining guidelines, draft for discussion purposes. Whitehorse, Feb. 1983. iv, 44 p.
Presents proposals for new guidelines for the management of water in Yukon placer mining operations. If adopted, they would replace those in effect since 1976 and would be issued under the authority of the Northern Inland Waters Act and related regulations.

51. Canada. Dept. of Indian Affairs and Northern Development, and
1983 Canada. Dept. of Fisheries and Oceans and Canada. Dept of the Environment. Yukon placer mining guidelines: summary statement. Whitehorse, Dec. 1983. 15, [17] p.
Presents the position of these departments on the Guidelines. Appendices provide summary statements from each of the departments.

52. Yukon. Dept. of Economic Development and Yukon. Dept. of
1983 Renewable Resources. Regulation of placer mining: Yukon government position. Whitehorse, 1983. v, 37 p.
Maintains that regulations should consider wildlife, vegetation, downstream users and compatability with present or planned water use from the outset rather than concentrating solely on the fisheries. Contends that the placer mining industry is as valuable as tourism.

53. Yukon. Dept of Economic Development and Yukon. Dept. of
1983 Renewable Resources. Yukon government summary statement on proposed Yukon placer mining guidelines. Whitehorse, Nov. 1983. 21 p.
Presents the Yukon government's position on the Guidelines. Includes their views on the economic importance of placer mining; fisheries management; integrated resource planning and management; and the administrative and information needs of placer mining.

54. Yukon Placer Mining Guidelines Public Review Committee. 1983 Resources, regulations & reality; report of the Yukon Placer Mining Guidelines Committee. Whitehorse: Canada. Dept. of Indian Affairs and Northern Development, 1983. xii, 147 p.
Committee chairman: Ione J. Christensen.
Copies of written briefs and transcripts of the hearings are available; one source is the Environmental Protection Service Library in Whitehorse.

3.ii.b. PLACER MINING - BRITISH COLUMBIA

55. Arsenault, J.S. 1982 Placer mining regulations and guidelines for the protection of the fisheries resources of British Columbia. Vancouver: Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat Management Division. Land Use Unit, 1982. 27 p. plus appendices. At head of title: Interim report.

4. ECONOMIC ASPECTS, INCLUDING THE PROJECTED ECONOMIC EFFECTS OF THE PROPOSED 1983 GUIDELINES

4.i. ECONOMIC ASPECTS - YUKON

56. Alaska Economics, Inc. Economic growth in Yukon, 1983 - 2003. Prepared for Yukon Dept of Economic Development and the Yukon River Basin Committee. Dec. 1983 as rev. Feb. 22, 1984. 163 p.
The role of gold in the economy is discussed on p. 27 - 32.

57. Canada. Environmental Protection Service. Environmental Strategies Directorate; Canada. Dept. of Indian Affairs and Northern Development and Canadian Resourcecon Ltd. Socioeconomic impact analysis of draft guidelines for the Yukon Placer Mining industry. 1983. 211 p.
Assesses the benefits and costs of the proposed guidelines by comparing the negative impacts on the placer mining industry with the positive impacts on the Yukon fishery.

58. DPA Consulting Limited. "Summary of analysis of economic reports for Yukon Placer Mining Guidelines Public Review Committee; final report," in Resources, regulations and reality, p.113 - 141. See item 54, the Christensen Report.

59. Fairman, Peter. The contribution of the placer mining industry to Yukon's economy. Whitehorse: Yukon. Dept. of Economic Development & Tourism. Economic Research and Planning Branch, Oct. 1984. iv,46,[9] p. Draft in-house report.
Estimates that placer mining contributes in the order of 10% to the Yukon's GDP including spin-off effects and concludes that there is no need for further research on the economics of placer mining.

60. Finning Tractor & Equipment Co. Ltd. A review of the impact of proposed placer mining guidelines on Finning Tractor & Equipment Co. Ltd.'s activity in the Yukon. Vancouver: Aug. 1983. 10 p. graphs.
Provides information on their 1978 - 82 activity with all non-tourist related sectors of the Yukon economy; their placer related employees in Yukon 1980-1982; and their placer related capital expenditures 1979-1981. Presented to the Yukon Placer Mining Guidelines Public Review Committee.

61. IEC Beak Consultants Ltd. An assessment of the proposed Yukon placer mining guidelines. Prepared for the Klondike Placer Miners Association. Richmond, B.C.: Oct. 1983. 1 v.
Critically analyzes reports prepared in support of the proposed guidelines and presents a re-assessment of the benefits and costs of the guidelines by comparing the impacts on the placer mining industry with those on the Yukon fishery.

62. M.E. Miller & Associates Ltd. Impact on the Yukon economy of the gold placer mining industry, 1979. Prepared for the Klondike Placer Miners Association. 1979. 12 p., tables.
Based on a survey of a cross section of miners holding water licences or permits during 1978. Includes average expenditures of single and family operators and larger company operations and total estimated expenditures of both 40 single plus 9 company operations and 70 single plus 9 company operations.

63. M.E. Miller & Associates Ltd. Impact on the Yukon economy of the gold placer mining industry, 1980. Prepared for the Klondike Placer Miners Association. Feb. 15, 1981. 15 p.
Using data obtained by interviewing a cross section of miners, provides average expenditures for three sizes of operations for the 1980 season and estimates of the direct and identified secondary impact of the industry.

64. Marvin Shaffer & Associates Ltd. Benefit-cost analysis of the proposed Yukon placer mining guidelines. Prepared for Canada Fisheries and Oceans. May 1983. 53 p.
Compares the economic value of the increased fish harvest projected to result from the implementation of the Guidelines with the economic loss imposed on the placer mining industry.

65. R.K. House and Associates Ltd. The calculation of costs in the IEC-Beak report. Sept. 1983. 7 p.
Discusses the economic aspects of the cost calculations in the benefit-cost analysis in the IEC-Beak report.

66. R.K. House and Associates Ltd. Discussion of benefit-cost analysis of Yukon mining guidelines. Prepared for the Yukon Conservation Society. July 1983. iii, 32 p. tables.
Discusses the benefit cost analysis of the Yukon placer mining guidelines and related information as presented in the Shaffer report and the Socioeconomic impact analysis...

(see items 64 and 57) prepared by the Dept. of the Environment and Canadian Resourcecon Ltd.

67. Stabler, J.C. et al. Input-output for Yukon and Yukon River Basin. Prepared for Canada. Dept of Indian Affairs and Northern Development; Yukon. Dept. of Economic Development and the Yukon River Basin Committee. Midwest Economic Research and Development, Nov. and Dec. 1983. 2 v.
Contents: v.1, Input -output table for Yukon; v.2, Computer programs. Includes a discussion of the development of the study; how the input-output tables were created; some applications of input-output; and the derivation and uses of multipliers.

68. Whitley, W.G. Note to file - placer mining; expenditures and production of the Yukon placer mining industry in 1978 and 1980; value of gold produced in the Mayo mining district 1976-81; notes on limiting placer mining to unglaciated areas. September-October 1982. (SEIA, p. 210)

4.ii. ECONOMIC ASPECTS - ALASKA

69. Louis Berger & Associates. Placer mining...its role in the Alaskan economy. Fairbanks: Alaska. Dept. of Commerce and Economic Development. Office of Mineral Development, March 1983. 22 p.
Measures the economic impact of the industry through its expenditures and the employment it generates. Cited as an example of an economic impact study done for another jurisdiction.

5. ENVIRONMENTAL ASPECTS

5.i. GENERAL

70. Burns, Bonnie. Methods, environmental impacts, treatment and control, reclamation and revegetation and management of placer mining in the Yukon Territory. Vancouver: UBC Westwater Research Centre, 1981. DRAFT.
Summarizes information on methods of placer mining, environmental impacts, treatment and control, reclamation and vegetation, and management. Outlines the direct and indirect effects of placer mining on the fisheries. (Ennis p. 27)

71. Osler, Tim. A study of mercury usage in placer mining operations in Yukon Territory and Northwestern British Columbia. Whitehorse: Canada. Environmental Protection Service, 1983. ix, 122 p. maps photos, tables. (DSS File Number 03SB.KE603-2-0155)
Includes information on mercury utilization; importing, transportation and handling methods; and field investigations.

72. Weir, D. A code of environmental practice in Alaskan placer mining. 1978. (Singleton, p. 128)

5.ii.a. WATER QUALITY - BIBLIOGRAPHIES AND MAPS

73. Madison, Robert J. Effects of placer mining on hydrologic systems in Alaska: status of knowledge. Anchorage: U.S. Dept. of the Interior. Bureau of Land Management, 1981. iii, 32 p., illus, tables. (BLM-Alaska Technical Report. no. 7)
Reviews literature on the effects of placer mining on water quality and quantity and on the aquatic environment. Suggests management alternatives. Includes Yukon studies. (BIN)

74. Yukon River Basin Water Quality Work Group. Bibliography of water quality information. Whitehorse: Canada. Environmental Protection Service, Dec. 1983. 6, 3 p. (Yukon River Basin technical report. Water quality no. 6)
An unannotated bibliography with entries listed in 2 sections: Water quality information from the Yukon River Basin and Studies of processes relevant to water quality of the Yukon River Basin.

5.ii.b. WATER QUALITY - GENERAL WORKS

For site specific studies, see items 143 - 169.

75. Almstrom, James E. Muddy waters: placer mining and our aqueous environment. Vancouver: UBC Westwater Research Centre, 1974. Mimeographed. (Fox, p. 49)

76. Canada. Dept. of Fisheries and Oceans. A rationale for the classification of rivers, streams and lakes in the Yukon Territory in relationship to the placer mining guidelines. Prepared for the Interdepartmental Committee on Placer Mining. 1983. 13 p.
Explains how the classification of rivers and lakes in the Yukon was developed and how the classification system will fit into the matrix of the A,B, C, and D streams as outlined in the Yukon placer mining guidelines.

77. Canada. Northern Affairs Program. Water Resources Division. 1984 placer mining inspections; summary of problems and non-active operations. Whitehorse: 1985. 6 p.
Lists, by district, problem operations giving for each the licence number, operators name, creek, and a brief description of the problem; non-licenced problem operations; and non-active licenced operations.

78. Fox, Irving K., Peggy J. Eyre and Winston Nair. Yukon water resources management policy and institutional issues: a Westwater report. Vancouver: UBC Westwater Research Centre, 1983. 52p., illus.
Presents a discussion of policy issues and options relating

to hydroelectric power, placer mining, fisheries, tourism and institutional arrangements. (BIN)

5.ii.c. WATER QUALITY - STATISTICAL AND OTHER DATA SOURCES

79. Canada. Inland Waters Directorate. National water quality data (NAQUADAT) 1960 - .
Machine readable data base of statistical information on the chemical, physical and biological analysis of surface and ground water. Can be searched through the Water Quality Branch, Inland Waters Directorate, Hull, Quebec.

80. Canada. Northern Affairs Program. Water Resources Division. Water resource information system.
SEE SECTION 2 ITEM H FOR INFORMATION

81. Canada. Northern Affairs Program. Water Resources Division. Water quality file 1984.
SEE SECTION 2 ITEM I FOR INFORMATION

82. Canada. Northern Affairs Program. Water Resources Division. Water use inspection reports.
SEE SECTION 2 ITEM J FOR INFORMATION

83. Hollingshead, A.B. Surface water data, Yukon Territory. Ottawa: Canada. Dept. of Indian Affairs and Northern Development. Northern Natural Resources and Environment Branch, 1975. 29, A5, B19 p. graphs, charts.
Summary data on the quantity and quality of surface water in the Yukon. Data collection and presentation is based on the Water Survey of Canada's stream guaging network which includes 50 stations distributed throughout Yukon.

84. Orecklin, M. and J. McLachlan. Small stream investigation in Yukon territory, 1975-1981. Whitehorse: Canada. Dept. of Indian Affairs and Northern Development. Water Resources Section. Water Quality Survey, 1982. 480 p.
Presents the following data for each station: historical streamflow summary; rating curve graph and recorded flow and elevation data; daily mean discharge.

85. Polyck, J.A. Placer miners 1984 season water quality monitoring program and annual reports, review and evaluation. Whitehorse: Canada. Northern Affairs Program. Water Resources Division, Jan. 1985. 9 p.
Indicates that 79 of the 206 active licenced operations, submitted data on monitored water quality in 1978. Of the 79, only 49 submitted effluent monitoring data and only 14 of them met the objective of less than or equal to .2ml/l settleable solids. Recommends that the Department attempt a more comprehensive educational program regarding the use of the Imhoff cone and try to ensure that monitoring programs are followed. Notes that only 109 licenced operations submitted annual reports to January 15, 1985 and

suggests that a standardized annual report form should be instituted.

86. Water Survey of Canada. Historical sediment data summary for Canadian rivers, 1978. Ottawa: 1980. xiii, 121 p. Published every 5 years.
Contains a summary of historical monthly and annual mean suspended sediment load, and annual extremes of daily suspended sediment concentration and loads and total annual suspended load. The only river in the Yukon included in the 1978 edition is the Yukon River at Whitehorse.

5.ii.d. WATER QUALITY - EFFLUENT & EFFLUENT TREATMENT

See also items 143 - 169 for site specific studies which may include information on placer mining effluent.

87. Alaska. Dept. of Environmental Conservation. Water Quality Management Planning Program. Placer mining and water quality. Fairbanks: Nov. 1979. 100 p. + appendices. (Non-Point Source Study Series. Section 208, PL92-500-95-217)
Discusses the practicality and applicability of technical alternatives for sediment control. (Shannon, p. 64)

88. Averill, D.W. Commentary on placer mining effluent treatment. Burlington, Ont.: Canada. Environmental Protection Service. Wastewater Technology Centre, April 1984. ii, 17 p. diagrams, charts.
Outlines the scope of the placer mining effluent treatment program, reports on jar tests for polymer coagulation of placer mining effluent, and outlines the requirements for a demonstration program.

89. Bainbridge, Kent. Evaluation of wastewater treatment practices employed at Alaskan gold placer mining operations. Prepared for U.S. Environmental Protection Agency. Effluent Guidelines Division. Buffalo, New York: Calspan Advanced Technology Center, 1979. 44 p. (Contract no. 68-01-4845)
Evaluates performance capabilities of settling ponds for removal of solids from wastewater. Includes estimated costs of installing and maintaining wastewater treatment systems. (Shannon, p. 67)

90. Canada. Dept. of Fisheries and Oceans and Canada. Environmental Protection Service. The attainment and cost of placer mining effluent guidelines. Prepared for the Interdepartmental Committee on Placer Mining. March 1983. i, 42 p.
Proposes ways in which placer miners may be able to obtain standards of 1000, 100 and 0 suspended solids and includes estimated costs of construction, purchasing and operation for the systems. Also known by the title Methods and costs for the attainment of placer mining guidelines effluent limits.

91. Canada. Dept. of Fisheries and Oceans and Canada. Environmental Protection Service. A rationale for standards relating to the discharge of sediments into Yukon streams from placer mines. Prepared for the Interdepartmental Committee on Placer Mining. New Westminster, B.C.: Feb. 1983. ii, 24 p.
Cover title: A rationale for the suspended solids standards for Yukon streams subject to placer mining.
Guidelines for an adminstrative/regulatory framework to manage possible pollution from sediments in streams due to placer mining activity. (BIN)

92. Canada. Environmental Protection Service. Yukon Branch. Use of flocculants in placer mining: a supplement to "The attainment and costs of placer mining effluent guidelines." Whitehorse: June 1983. 8 p. illus., tables.
Includes results of flocculant tests designed to estimate the effective kinds, doses and costs of applying these compounds to an artificial placer mining effluent. Updates the cost estimates given on p. 29 - 32 of The attainment and cost of placer mining effluent guidelines.

93. Canada. Northern Affairs Program. Water Resources Section. Settling facilities at Yukon placer mines. Whitehorse: 1979. 1v. maps, photos.
Evaluation of settling systems at 14 placer mines selected to provide a range of sizes and types of operations on different creeks in the Dawson and Mayo Districts.

94. Ken Weagle Environmental Consultant. Report on the Technical Workshop on suspended solids and the aquatic environment, June 17 and 18, 1980. Canada. Dept. of Indian Affairs and Northern Development, 1980. 24 p. + appendices.
Includes 7 technical papers and the discussion of the issues presented in them. Concluded that there was insufficient information to set effective water quality standards for suspended solids and the aquatic environment and recommended additional studies on the aquatic ecosystem including a long term environmental evaluation of an industrial operation having a suspended solids effluent. (Ennis)

95. Ken Weagle Environmental Consultant. Treatment of placer mining effluents using settling ponds. Volume 1 Technical report. Volume 2 Appendices. Prepared for the Yukon Dept. of Economic Development & Tourism. Whitehorse: 1984. 2v., tables, graphs. (Contract 5-4-0276)
Results of a 1984 study on settling ponds used in 22 Yukon mines. Includes data on pond dimensions, water flows, gravel through-put yardages, grain-size distributions of pay gravels and suspended solids, settleable solids and turbidity levels.

96. Kerr Wood Leidal Associates Ltd. Review of Yukon placer mining operations and cost estimates for a demonstration project(s). Prepared for Canada. Environmental Protection Service. Whitehorse: 1985? 12 p.
Includes cost estimates for 2 waste water treatment

demonstration projects for large and medium sized operations.

97. Lin, Hsing Kuang. Application of hydrocyclones for the treatment of wastewater in gold placer mining. Fairbanks: University of Alaska. Mineral Industry Research Lab., May 1979. 97 p., illus. M.Sc. Thesis U. of Alaska May 1979. (M.I.R.L. Report no. 53)
Reports on a study which determined that with the use of a 4" hydrocyclone, more than 80% of solids coarser than 16 microns could be removed without the addition of flocculants. Includes a flowchart of a recommended closed circuit system for the treatment of placer mining effluents.

98. R & M Consultants, Inc. Placer mining settling pond design handbook. Alaska. Dept. of Environmental Conservation. Water Quality Management Planning Program, Jan. 1983. i, [26] p.
Discusses the design, construction and operation of settling ponds.

99. R & M Consultants, Inc. Placer mining wastewater settling pond demonstration project report. Alaska. Dept. of Environmental Conservation, June 1982. 60 p. + appendices, maps, tables.
Reports on the design, construction, operation and monitoring of a settling pond and the sampling of 15 other control mine sites in 1981.

100. Reid Crowther & Partners Ltd. and Bethell Management. A study of the potential use of polyacrylamide flocculant use in the Yukon placer mining industry. Prepared for Canada. Dept. of Indian Affairs and Northern Development. Arctic Land Use Research Progam. 1984. 3v.
Cover title: A study of polyacrylamide flocculants in the Yukon placer mining industry.
Contents: Summary report; Test results for individual placer mines; Appendices.

The Summary report contains a summary of the studies conducted at 15 placer mine sites to determine the effectiveness of flocculant aids in removing suspended solids from effluents.

Test results for individual placer mines describes each of the 14 mines surveyed in terms of its general location, use of manpower and equipment, types of materials being mined, water sources and effluent treatment system. It also contains results of the flocculant aid tests on effluent samples. Mines were located on the following creeks: Seymour, Revenue, Martin, Livingstone, Highet, Johson, Clear-Right Fork, Bonanza, Eldorado & French Gulch, Miller, Hunker, Black Hills, Henderson, and Fourth of July.

The Appendices contains data sheets summarizing the results of each visit to each minesite; summaries of the test procedures used to test water and soil samples; manufacturers' specifications on the flocculant aids; and

results of the soil sampling for individual minesites.

101. Sexton, Shaun. Preliminary draft of placer mining recycle system design handbook. Fairbanks: Alaska. Dept. of Environmental Conservation, 1983.
Includes a mathematical model developed for determining sluicing time, recycle-sedimentation pond volume, and trapped sediment storage volume in a recycle system. (Shannon p. 116)

102. Sexton, Shaun. Settling pond design. Fairbanks: Alaska. Dept. of Environmental Conservation, March 1982. 27 p. illus.
Discusses criteria to be considered in settling pond design and alternative techniques for reducing pond size. Presents three methods for designing settling ponds. (Shannon p. 115)

103. Shannon & Wilson, Inc. Placer mining wastewater treatment technology report. Prepared for the Alaska Dept. of Environmental Conservation. Fairbanks: 1985. 4 v.
A study of placer mine wastewater recycling and alternatives. Study consisted of a literature review, lab testing of chemicals for effluent clarification, pilot scale testing of the effects of recycled water on fine gold recovery and data gathering at active mines in interior Alaska. The intent of the study was to apply the technical and economic costs and benefits of recycling to placer mining to determine the effect of recycling on fine gold recovery and pollution control; to evaluate alternatives to recycling to compare their cost-effectiveness at increasing gold recovery and reducing water use and pollution; to determine the best treatment process at the 3 primary active placer mines studied; to determine whether Alaska and federal water quality standards could be attained by mining practices covered in the study; and to recommend promising alternative technologies that warrant further study. (Introduction)

104. Sigma Resource Consultants Ltd. Environmental studies, Clear Creek project, sediment control plan. Prepared for Queenstake Resources Ltd. Feb. 1980. 1v. maps, plans, charts.

105. Sigma Resource Consultants Ltd. Water use technology for placer mining effluent control Whitehorse: Canada. Dept. of Indian Affairs and Northern Development, 1981. 1 v., maps, tables.
Discusses processes for the reduction of sediment discharges and related costs. Suggests that effluent treatment technology must be applied on a site specific basis. Includes case studies of the following operations at the named creeks: Tatlow/Hunker Creek, Territorial Gold/Henderson Creek, Taylor/Duncan Creek, Kostem Resources/Litttle Gold.

106. Stanley Associates Engineering Ltd. Development & demonstration of treatment technology for the placer mining industry. Draft report. Prepared for Canada. Environmental Protection Service. March 1985. 1v. graphs, charts.
Discusses potential studies designed to test the applicabil-

ity of flocculants to remove suspensions from placer mining effluents, to develop criteria for low cost treatment systems using flocculant-aided settling ponds and to demonstrate the technology at full scale in an actual operation.

107. United States. Environmental Protection Agency. Office of Enforcement. Evaluation of settleable solids removal at Alaska gold placer mines. Anchorage: Alaska, 1977. 17 p. (EPA-330/2-77-021)
Presents stream turbidity, suspended solids, settleable solids, iron and arsenic data from ten different placer mines. Suggests that complete recycle would be feasible if the settleable solids limitation of .2ml/L is achieved. (Shannon, p. 89)

5.iii. FISHERIES

There are a number of files of fisheries information, for example, see items 122 - 126 below, and a number of site specific studies, see items 143 - 167 below, but no one master data base of fisheries information or index to readily bring all the known information together. The Dept. of Fisheries and Oceans is in the process of adding references to studies in its library to the appropriate records in its its Lake and stream files - it is hoped that this will enable them to locate all the works they have on specific waterbodies. There is a need to make the known information more readily accessible. It is therefore recommended that consideration be given to indexing existing studies so as to provide ready access to the data by type, e.g., water quality, fisheries, etc. and by the geographic area covered. This indexing could either be provided within the proposed bibliographic data base for placer mining information or as a separate data base.

Experts in the field feel much more work needs to be done on the relationship between placer mining and fish. For example, Ennis' Annotated bibliography and information summary on the fisheries resources of the Yukon River Basin in Canada (1982) notes that studies on streams affected by placer development should include biophysical inventories of the streams, gathering of hydrological information, exploration of methods for stream rehabilitation, and experiments to determine specific effects of placer effluents on the various life stages of northern fish species and overwintering studies. (p. 239, Yukon River; p. 248 White River sub-basin; p. 260 Russel Creek, Pelly River system; p. 268 Teslin system)

5.iii.a. FISHERIES - BIBLIOGRAPHIES AND MAPS

108a. Canada. Dept. of Fisheries and Oceans. Fisheries information and stream reach classification maps. Whitehorse: 1982. 22 maps; scale 1:250,000.
Data from site reports, personal knowledge and expectations based on the habitat of specific sites were used to classify

stream reaches and indicate the species and the life processes present in each reach. Though the data and classifications have been revised for some streams, the maps are not being updated.

108b. Cleigh, T.R. and L.R. Russell. Fisheries and fish related publications in the Yukon. Vancouver: Canada. Dept. of Fisheries and Oceans, April 1980. 1 v. (Canadian Technical Reports of Fisheries and Aquatic Sciences no. 938)
Includes 444 unannotated entries arranged alphabetically by author. A subject index provides references to the entries under 14 broad subject headings.

109. Ennis, G.L. et al. Annotated bibliography and information summary on the fisheries resources of the Yukon River Basin in Canada. Vancouver: Canada. Dept. of Fisheries and Oceans. Water Use Unit. Habitat Management Division, 1982. 278 p. (Yukon River Basin study project no. 31) (Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 1657)
Annotated bibliography of 223 fisheries reports. Entries are arranged by basin and then alphabetically by author Information is evaluated according to its applicability to the Yukon River Basin study objectives. Identifies data gaps and studies required to fill in gaps.

110. Envirocon Limited. [Yukon mapping project - placer mining and fish resources] Canada. Dept. of Indian Affairs and Northern Development, 1980. 2 maps with 12 overlays. Yukon is mapped at 1:1,000,000 and the Dawson-Mayo area at 1:250,000.
A series of 6 overlays for each of these maps show fisheries references; distribution of trout, char, whitefish, pike and burbot; distribution of Arctic grayling; distribution of Pacific salmon; access roads, airstrips and water users; and placer mining activities. The latter shows producing operations; designated streams; and staking on gold bearing streams, on streams whose gold bearing potential is unknown, and on river bar deposits.

5.iii.b. FISHERIES - GENERAL WORKS

This section includes a number of titles which, while not specifically on the Yukon fishery/placer mining issue, provide useful background information on the protection of the fishery resource and have been cited in the impact studies done for the public hearings on the 1983 Guidelines.

111. Burns, Bonnie. The fish resource of the Yukon Territory. Prepared for Winston Mair, Inc. July 1981. iv, 35 p. (Ms. Burns is identified as a research consultant for UBC Westwater Research Centre)
Contains information derived from existing reports and data files on the sport, commercial, domestic and native subsistence fishery; fish farming and impacts on the fishery

resulting from development. Concludes with recommendations of topics for further research.

112. Canada. Dept. of the Environment. Fisheries Marketing Service. Statement of Fisheries Service concerns and responsibilities presented to the Yukon Territorial Water Board of Inquiry into the placer mining industry. Nov. 1973. 19 p.
Outlines the main implications that placer mining activities have on the indigenous fish stocks of the Yukon gold fields and includes recommendations for their control. Presents available technology to overcome the detrimental effects of mining on fish. (Ennis, p. 32)

113. Canada. Dept. of Fisheries and Oceans. Pacific Region Field Services Branch. Annual review. Vancouver.
In the 1983 edition, the section on the Whitehorse District includes information on the commercial salmon fishery, sport fishery, Indian food fishery, salmon escapements and habitat concerns. Includes catch statistics. Information is based on that presented in the Annual narratives... for each of the sub-districts. See Section 2, item A for more information on these narratives.

114. Dane, B.C. Culvert guidelines: recommendations for the design and installation of culverts in B.C. to avoid conflict with anadromous fish. 4th ed. Vancouver?: Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat Protection Division, Jan. 1981. iv, 57 p. (Fisheries and marine service technical report no. 811) Note: 1st edition was published in 1978.

115. Dane, B.C. A review and resolution of fish passage problems at culvert sites in British Columbia. 4th ed. Vancouver: Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat Protection Division, March 1983. x, 126 p. illus., charts. (Fisheries and marine service technical report no. 810) Note: 1st. edition was published in 1978.

116. De Leeuw, A.D. A British Columbia stream habitat and fish population inventory system. British Columbia. Dept. of the Environment. Fish Habitat Improvement Section, 1981. iii, 23 p.
Describes the methodology used in the B.C. stream habitat and fish inventory system.

117. Hall, J.E. and D.O. McKay. Effects of sedimentation on salmonids and macro-invertebrates. Alaska. Dept. of Fish and Game. Habitat Division. Dec. 1982. Draft report. (SEIA, p. 208)

118. Langer, O.E. Effects of sedimentation on salmonid stream life. Canada. Environmental Protection Service, June 1980. 20 p. Draft report. Also published in Report on the Technical Workshop on Suspended Solids and the Aquatic Environment by Ken Weagle Environmental Consultant, see item 94.

119. Quadra Economic Consultants Ltd. Fish and wildlife in British Columbia: a review of resource values. Prepared for B.C. Fish & Wildlife Branch. 1977.

120. Toews, D.A.A. and Brownlee, M.J. Handbook for fish habitat protection on forest lands in British Columbia. Vancouver: Canada. Dept. of Fisheries and Oceans. Pacific Region. Habitat Protection Division. Land Use Unit, 1981. vii, 165 p. illus., tables.
Intended to provide a synthesis of useful information including guidelines which could form the basis of recommendations by DFO field staff when offering input to the referral system of provincial agencies.

121. Yukon River Basin Committee. Fisheries Work Group. Yukon River Basin study; Fisheries Work Group program report. Vancouver: June 1984. 1 v.
Includes a summary of each project carried out by the Fisheries Work Group. Pages 7-5 - 7-13 review the effects of placer mining activities on fish and the reaction to the 1983 Yukon placer mining guidelines. Includes a summary of recommendations made by the Yukon Placer Mining Guidelines Public Review Committee which have implications for the Yukon fishery. Concludes with recommendations for fisheries management guidelines and research and inventory requirements.

5.iii.c. FISHERIES - STATISTICAL AND OTHER DATA SOURCES

Statistics Canada does not provide information on the value of the fishery to the Yukon. The 1981 edition of Fish products industry 32-216 (issued July 1983) reports only 2 establishments in the Yukon and the Northwest Territories combined and gives no information on production costs, etc. Similarly the 1980 edition of Products shipped by Canadian manufacturers 31-211 (issued Jan. 1984) gives figures on the value of quantity of fishery products for Canada as a whole and for the other provinces but not for Yukon.

Works listed below and studies in the following section, Commercial and Sports Fishery, do include some information on the value of the fishery to Yukon.

122. Canada. Dept. of Fisheries and Oceans. Whitehorse District. Annual narrative reports: Alesk-Taku, Northern B.C. - Yukon South, and Yukon Arctic sub-districts.
SEE SECTION 2 ITEM A FOR INFORMATION

123. Canada. Dept. of Fisheries and Oceans. Whitehorse District. Area history of salmon catch.
SEE SECTION 2 ITEM B FOR INFORMATION

124. Canada. Dept. of Fisheries and Oceans. Whitehorse District. Lake and stream files.
SEE SECTION 2 ITEM C FOR INFORMATION

125. Canada. Dept. of Fisheries and Oceans. Whitehorse District. Salmon stream and spawning ground reports.
SEE SECTION 2 ITEM D FOR INFORMATION

126. Canada. Dept. of Fisheries and Oceans. Whitehorse District. Spawning escapement catalogue.
SEE SECTION 2 ITEM E FOR INFORMATION

127. Usher, P.J. Status report on fur, fish and game harvest data in the Yukon Territory. A report to the Northern Pipelines Branch, Dept. of Indian and Northern Affairs. 1979. 36 p.
Describes the data collection systems used by the Yukon Wildlife Branch and the federal Dept. of Fisheries and Oceans to assess annual fur, fish and game harvests. Assesses the difficulties associated with data collection and the accuracy of the data. Concludes that there is some basis for estimating the total volume of fur, fish and game harvested by non-native Yukoners, although there is little basis for allocating these estimates regionally within the Yukon. While there is some basis for estimating the total harvest of furs by Indians there is none for estimating their total harvest of fish and game. (Ennis, p. 178)

5.iii.d. FISHERIES - COMMERCIAL AND SPORT

128. Boland, J.P. The Yukon fishery resource: its existing role and its future potential. Vancouver: Canada. Dept. of the Environment. Pacific Region. Fisheries Marketing Service. 1973. 43 p. (NOB/ECON 1 - 73)
Includes sections on commercial, sport and subsistence food fishing and focuses on the influence these activities have on the residents of the Yukon. (Ennis, p. 22)

129. Canada. Dept. of Fisheries and Oceans. [Paper presented] at public meeting to discuss freshwater commercial and domestic fishing in the Yukon, March 26, 1981, Klondike Inn, Whitehorse. 1981. 19 p. In Whitehorse file 5161-1 Domestic fishing general.
Includes a history of the freshwater commercial and domestic fishery in the Yukon by Mal Farquhar and data on whitefish and trout landings as recorded by catch card returns.

130. Canada. Dept. of Fisheries and Oceans. Domestic and commercial questionnaires [on the fishery] 1981. Whitehorse District 10, Files.
Includes information on location, time spent fishing, species caught, opinions on fish management, and, for commercial fisheries, expenditures and income related to fishing, species sold, and fish marketing. (Ennis p. 41)

131. Canada. Dept. of Fisheries and Oceans. Recreational Fisheries Branch and Yukon. Wildlife Branch. 1980 survey of sportsfishing in the Yukon. Ottawa: 1983. iv, 41 p. + appendices.
Provides information on the numbers, origins, and destinations of anglers; their expenses and investment in equipment; the number and kinds of fish harvested and the amount of effort required to catch them. Includes samples of the questionnaires.

132. Canada. Dept. of Fisheries and the Environment. Recreational Fisheries Branch. Survey of sportfishing in the Yukon Territory in 1975. Ottawa: 1978.
Based on 1,056 responses to a 1975 survey of anglers. Details the number and characteristics of anglers; their place of residence; the number, month and locations of fish caught; and their annual investment. (Ennis, p. 45)

133. Canadian Resourcecon Ltd. An analysis of three sport fisheries. Prepared for Canada. Dept. of Fisheries and Oceans. Vancouver, Jan. 1982. (SEIA p. 205)

134. Howard Paish and Associates Ltd. Yukon sport fishery: a policy oriented assessment of sport fishing in Yukon. Prepared for Canada. Dept. of Fisheries and Oceans; Canada. Dept. of Indian Affairs and Northern Development; Yukon. Dept. of Renewable Resources; and Yukon. Dept. of Tourism and Economic Development. 1981. 233 p.
Reviews the nature of the aquatic ecosystems that support fish, the uses made of fish and the legislative and institutional aspects of the sports fish management. Assesses the likely future for sports fishing and the management systems required. (Ennis p. 150)

135. Masse, W.D. and K. Peterson. Evaluation of incremental recreational benefits for salmonid enhancement. Salmonid Enhancement Program. March 1977. (SEIA, p. 209)

136. P. Eby and Associates. Economic feasibility of a freshwater fish commercial fishery and processing plant in the Yukon. Prepared for the Council of Yukon Indians. Dec. 1980.
Examines the constraints to increased commercial fishing by native fishermen and concludes that while it doesn't seem feasible to establish a processing plant based solely on freshwater fish, assistance to individual native fishermen would improve the potential for native fishermen to increase sales within the Yukon. (Ennis, p. 63)

137. Seigel, N. and C. McEwen. A historical overview of fishing in the Yukon. Prepared for Canada. Dept. of Fisheries and Oceans. Pacific Rim Region. Whitehorse: Northern Biomes Ltd., Environmental Services, June 1984. ix, 138 p.
Includes information on licenced commercial fishing; subsistence and domestic fishing; and licenced sport fishing. Summarizes the fishery regulations for the Yukon. Provides

statistics on commercial sales of lake trout and whitefish in 1981 and 1982 and licence and landing statistics for specified lakes for 1972 - 1983.

138. Sinclair, W.F. and Obert Switzer. The economic value of the Yukon sport fishery. Canada. Dept. of the Environment. Pacific Region. Fisheries and Marine Service. Economics Unit, April 1973. 91 p., tables. (NOB/ECON 2 - 73)
Reports on a study conducted during the winter of 1971 and summer of 1972. Presents information on the net economic benefits, economic impact and value of the Yukon sports fishery and opinions of the fishermen as to the quality of fishing and its management.

5.iv. RECLAMATION

See also items 143 - 169 below for additional studies including information on revegetation and reclamation.

139. McKendrick, J.D. et al. Natural revegetation of placer mined lands of interior Alaska II. Fairbanks: University of Alaska. Mineral Industry Research Laboratory. Mining and Mineral Resources Research Institute and University of Alaska School of Agriculture and Land Resources Management, March, 1980. p. 27 - 33. (Open File Report no. 80-2)
Reports on a study of the revegetation of tailings around Fairbanks which was undertaken to obtain a broad picture of the present stage of revegetation in order to facilitate further ecological work and assisted rehabilitation.

140. R. M. Hardy and Associates. Guidelines for reclamation of placer mining operations - Klondike region. Prepared for the Yukon Territory Water Board. March 1979. 43 p. (MAD, p. 29)

141. Singleton, G.A. et al. Fish and wildlife habitat recovery in placer mined areas of the Yukon. Final report. Prepared for Canada. Dept. of Indian Affairs and Northern Development. Calgary: Hardy Associates (1978) Ltd., 1981. xii, 131 p., illus., maps.
A study of the rate and degree of natural fish and wildlife habitat recovery in placer mined areas of Yukon. Identifies factors which are most limiting to habitat recovery and suggests methods to enhance the habitat recovery process. (YUK)

142. Weir, D. et al. A comparative study of the use of disturbed and undisturbed areas by wild vertebrates in the Klonkike, Yukon Territory with recommendations for placer mining reclamation practice. Prepared for the Klondike Placer Miners Association. C.C. Hawley and Associates, Inc., June 1980. 45 p.
A quantitative wildlife assessment of several paired areas of undisturbed and placer mined areas near Dawson. Includes

aquatic investigations in placer mined Jensen and Gold Run Creeks and undisturbed Burnham Creek. Makes recommendations relating to reclamation procedures and suggests that more studies of fish and wildlife of disturbed and undisturbed areas are needed to assess the impact of mining and to monitor the effectiveness of reclamation and refine reclamation practices. (Ennis, p. 111)

5.v. SITE SPECIFIC STUDIES DEALING WITH FISHERIES, WATER QUALITY, WILDLIFE

This section includes some studies which deal with reclamation; see the preceding section for additional studies.

As indicated previously, consideration should be given to indexing the data in these studies so as to provide access to it both by type, e.g., water quality, etc. and by geographic area covered.

143. Craig, D.B. Rehabilitation of Sixty Mile River Valley. Whitehorse: Regional Geologists Office, Northern Affairs Program, 1976. Unpublished report.

144. Elson, M.S. and L.W. Steigenberger. A biological investigation related to placer mining operations in the Moosehorn Range in Yukon Territory. Prepared for Claymore Resources. Vancouver: Northern Natural Resources Services Ltd., 1976.
Assesses the environmental impact of placer mining in Swamp, Discovery and Claymore Creeks. Includes fish sampling information. (Ennis p. 67)

145. Elson, M.S. and L.W. Steigenberger. An environmental assessment of the Sixty Mile River in summer. Prepared for Cogasa Mining Corporation. Vancouver: Northern Natural Resources Services Ltd.,1976. 115 p.
Includes data on the distribution and abundance of fish, age and growth relationships, length-weight relationships, sex ratios, size of fish at maturity, food habits, spawning habitat and migrational patterns. (Ennis, p. 148)

146. Envirocon Limited. Matson Creek environmental assessment. Prepared for Goldmark Minerals Limited. March 1980. 68 p., tables, charts.
A study of Matson Creek's topography and physiography, surface materials and vegetation, wildlife, fish, hydrology, sediment and reclamation considerations.

147. Horler, Aileen, R.A.C. Johnston, and G.M.W. Cronkite. An assessment of the fisheries resource in 18 lakes within the Yukon Territory, Canada. Whitehorse: Canada. Dept. of Fisheries and Oceans, Dec. 1983. 160 p. illus. tables. (Yukon River Basin study project report. Fisheries no. 4)
Information related to the size, condition, age, sex composition, maturity and growth of fish was compiled by

species and by population for the following lakes: Alligator, Big Kalzas, Claire, Coghlan, Ethel, Fox, Jojo, Little Atlin, Little Salmon, Mayo, Michie, Quest, Shafu, Toye, Twin, Wolf, Sekulmun, Dezadeash.

148. Johnson, Eric H. Report concerning environmental considerations of Cogasa Mining Corporation Sixty Mile River Valley operation. 1976. Consultants report.

149. Ken Weagle Environmental Consultant. An evaluation of aquatic resources of Big Creek, Yukon Territory. Prepared for Queenstake Resources Ltd. Whitehorse: 1982. 1 v.
Reports on the summer 1981 examination of the aquatic habitat of Big Creek and its classification using the B.C. R.A.B. aquatic inventory system. The results of a winter reconnaissance conducted on March 9, 1981 are summarized in the appendix. (Ennis p. 184)

150. Klassen, W.J. and J.P. Jack. Preliminary biological reconnaissance of the sixty mile river floodplain below Glacier Creek. Whitehorse: Yukon. Dept. of Renewable Resources. Wildlife Branch, 1980. [78] p., maps, photos.
Report includes fur harvest figures, information on vegetation, amphibians, large and small mammals, birds, reclamation, and the effect of placer mining on the environment. Report on the degree of activity in the sixty mile river drainage 1978, by D. Drummond, Conservation Officer, Dawson City is printed in Appendix 3.

151. Knapp, W. Summary and analysis of fish capture data from placer mining study 1975. Canada. Dept. of the Environment. Fisheries Service, 1975. 15 p., maps, charts.
Reports on population and migrational behaviour data collected from Sulphur and Bonanza Creeks during 1975. (Ennis, p. 124)

152. Knapp, W. Summary and analysis of sediment and preliminary biological data from placer mining operations - 1974. Vancouver: Canada. Dept. of the Environment. Fisheries Service, 1974. Unpublished memorandum.
Reports on sampling for bottom fauna and fish and the physical/chemical conditions of the following streams: Bonanza, Hunker, Dominion, Sulphur and Flat Creeks; on the Klondike River; and on several other small creeks. (Ennis p. 125)

153. Knapp, W. Yukon placer mining study. Vancouver: Canada. Dept. of the Environment. Fisheries Service, 1976. Unpublished report.
Discusses the results of the 1974 and 1975 placer mining studies (see items 151 and 152). Includes a bibliography on the effects of suspended sediments on stream life. (Ennis p. 123)

154. Mathers, J.S., N.O. West and B. Burns. Aquatic and wildlife resources of seven Yukon streams subject to placer mining. Ottawa: Canada. Dept. of Fisheries and Oceans, 1981. 2 v. (v.2 is appendix)
Contains fish population, water chemistry and wildlife observations made above and below placer mines in winter, spring, summer and fall on South Big Salmon River, Big Creek, Thistle Creek, Scroggie Creek, Clear Creek, Johnson Creek, and Duncan Creek.

155. McLeay, D.J. et al. Effects on Arctic grayling (Thymallus arcticus) of prolonged exposure to Yukon placer mining sediment ; a laboratory study. Canada. Dept. of Fisheries and Oceans, 1984. xiii, 96 p. illus. (Yukon River Basin study project report. Fisheries no. 9) (Canadian Technical Report of Fisheries & Aquatic Sciences no.1241)
Reports on the results of the effects on underyearling Arctic grayling of a 6-week exposure to differing strengths of suspended placer mining sediment. Discusses the environmental relevance of the findings.

156. McLeay, D.J. et al. Effects on Arctic grayling (Thymallus Arcticus) of short-term exposure to Yukon placer mining sediments: laboratory and field studies - May 1983. Canada. Dept of Fisheries and Oceans, 1983. 734 p., tables. (Yukon River Basin Study Project Report. Fisheries no. 2) (Canadian Technical Report of Fisheries & Aquatic Sciences no.1171)
Describes a program of controlled lab and field bioassys conducted during 1982/83 to examine the acute effects of suspensions of placer mining sediment on underyearling Arctic Grayling. Sites used were Highet Creek (turbid water) and Minto Creek (clear water).

157. Northern Natural Resource Services. Additional environmental information of the Sixty Mile River in summer. Prepared for Cogasa Mining Corporation. 1976. 17 p.
Provides data on water samples taken from sites along the Sixty Mile River and surrounding tributaries, and on fish samples taken from points upstream and downstream of Miller Creek. Recommends that the area upstream of Miller Creek be protected from mining. (Ennis, p. 147)

158. Northern Natural Resource Services. An environmental assessment of the Sixty Mile River in winter. Prepared for Cogasa Mining Corporation. April 1976. 26 p.
Provides data on sampling conducted at 10 locations on the Sixty Mile River and selected tributaries and on water quality measurements which were taken where possible. (Ennis p. 149)

159. Northern Natural Resource Services. Fisheries investigations of Clear Creek, Yukon Territory, in 1977 and 1979. Prepared for Crescent Mines Ltd. & Sundance Gold Ltd. 1979. 20 p.
Presents fish sampling data on Clear Creek near its confluence with the Stewart River and within the property of

the mining firms. Presents water quality data from Clear Creek, McQuesten, Stewart and Pelly Rivers in tabular form. (Ennis p. 143)

160. Pendray, T. Life history and habitat utilization of Arctic grayling (Thymallus arcticus) in two central Yukon drainages. Whitehorse: Yukon. Dept. of Renewable Resources. Land Planning Branch, Nov. 1983. 44, [8] p. (Yukon River Basin study project report. Fisheries no. 8.)
Reports on studies carried out on Lynx and Haggart Creek in the McQueston River drainage and Davidson Creek in the Mayo River drainage. Includes fish sampling summaries and water quality data.

161. Pendray, T. Stream habitat inventory and evaluation for two study areas in the Yukon River Basin. Whitehorse: Yukon. Dept. of Renewable Resources. Land Planning Branch, Nov. 1983. 55 p. + appendices (Yukon River Basin study project report. Fisheries no. 3.)
Results of a biophysical stream inventory and fish habitat evaluation on 65 streams in the Stewart River drainage and 33 streams east of Atlin, B.C. Discusses a proposed stream classification system and includes recommendations regarding inventory and evaluation methodologies.

162. Roxborough, V.A. & G. Zealand. Russell Creek placer mining operation. Whitehorse: Canada. Dept. of Fisheries and Oceans, 1981. 3p. Unpublished note.
Results of a fisheries survey of Russell Creek. As a result of the study, Dawson Mining Equipment Ltd. was requested to implement total re-circulation of their water and make no direct discharge into Russell Creek. (Ennis p. 158)

163. Sigma Resource Consultants Ltd. Environmental studies, Clear Creek gold dredging: preliminary findings. Prepared for Queenstake Resources Ltd. Nov. 1979. 1v., col. photos, maps, charts.
Includes information on water sediment, aquatic insects, vegetation and fish. Discussion of the physical setting and biological resources of the area is followed by a discussion of potential environmental concerns and related mitigation procedures.

164. Soroka, I.K. & G. Mackenzie-Grieve. Biological and water quality assessment at a placer mine on Barlow Creek, Yukon Territory. Whitehorse: Canada. Environmental Protection Service. Yukon Branch, May 1984. vii, 102 p., maps, tables. (Regional Program Report 84-16)
Report of assessment done June - Sept. 1982. Contents: Appendix 1: information on the collection, preservation, analysis or identification methods used and water quality criteria; Appendix 2: water quality, sediment and bottom fauna data.

165. Soroka, I.K. & G. Mackenzie-Grieve. Little Gold - a biological and water quality assessment at a placer mine on Little Gold Creek, Yukon Territory. Whitehorse: Canada. Environmental Protection Service. Yukon Branch, 1983. (Regional Program Report 83-06)

166. Steigenberger, L.W., & Elson, M.S. Treatment of fisheries information collected from Clear Creek, Yukon Territory, in relation to government placer mining guidelines. Prepared for Queenstake Resources Ltd. 1982. (YPMGRC. Bibliography)

167. Williams, C.N. Preliminary summary and analysis of suspended sediment data from placer mining operations - 1973. Whitehorse: Canada. Dept. of Indian and Northern Affairs, 1973. 1 v.
Preliminary report on suspended sediment sampling of placer mining creeks in the Klondike Gold Fields, Dawson. (BIN)

5.v.b. SITE SPECIFIC STUDIES - ALASKA

168. Chang, S.S. Water quality studies of placer mining operations on Livengood and Harrison Creeks. M.Sc. Thesis, University of Alaska, May 1979. 109 p.

169. Wolff, Ernest N. and Bruce Thomas. The effects of placer mining on the environment in central Alaska. Fairbanks: University of Alaska. Mineral Industry Research laboratory, Dec. 1982. 66 p. illus., maps. (M.I.R.L. Report no. 48)
Provides data on the effects of the Livengood and Crooked Creek operations on fish, vegetation, water quality, sedimentation and hydrology. Valleys were examined to see if sedimentation had taken place and tailings were examined for revegetation.

6. HERITAGE SITES

A general survey of archaeological, paleontological and historic sites has not been done for the Yukon. Known archaeological and historic sites are inventoried as indicated below. The Heritage Branch does receive land use applications and is thereby made aware of miners'requests to construct access roads. However, as the Branch does not receive copies of applications made to the Water Board, they are not kept informed of mining developments.

The Branch suggested that a general archaeological/historic sites survey of either the Territory or known placer mining sites should be completed. If a site deemed to be of high value were to be impacted by a placer operation, the Branch would have the option of refusing permission for the operation or requiring the operator to excavate and salvage the site. Though there are regulations governing the disturbance of heritage sites, few miners are likely to be aware of them. They are not listed

among the regulations miners must comply with in such handbooks as Land use guidelines, mineral exploration: Yukon and Northwest Territories 1983.

It was not feasible to attempt to compile a comprehensive listing of reports on heritage sites in placer mining areas; those listed below are those located during the search for materials of primary concern in this inventory.

170. Archaeological Survey of Canada. Canadian heritage inventory network (CHIN) [machine-readable data base]
Contains data on archaeological, but not paleontological, sites. Includes about 1600 Yukon sites to date; about 200 additional sites are added each year. The base can be searched by such elements as site name, site type, Borden block number, UTM grid system, name of researcher, etc. The Yukon Heritage Branch supplies data to the Archaeological Survey of Canada for input into this data base but does not yet have the capacity to search this data base locally. They write to or phone the Archaeological Survey of Canada when they wish to have searches made. Specific site data is guarded from the public.

171. Canada [Yukon Act. Regulations] Regulations for the protection and care of archaeological sites in the Yukon Territory. 3 p. Copies are available from the Yukon Heritage Branch.

172. Gates, Michael S. 1981 goldfield historical survey or report on a brief survey of historic remains located in the goldfields surrounding Dawson City. Prepared for Territorial Gold Placers Ltd. Sept. 1981. 49 p., plus appendices, 2 maps in pocket.
Includes site information record sheets. The report can be consulted at the Yukon Heritage Branch.

173. Gates, Michael S. and R. Hartmier. The goldfields history recording project: a report on and compilation of information gathered during the summer of 1983. 19 p. plus photos, appendix. Unpublished report; contact the Yukon Heritage Branch or the author.
Lists historic sites and provides related placer claim numbers. Slides and photographs available only from the author.

174. Hunston, Jeffrey R. A bibliography of Yukon archaeology, anthropology, and quaternary research. Vancouver: Simon Fraser University. Dept. of Archaeology, 1978. iii, 102 p.
Entries are arranged by author; there is no subject index. Does not include annotations.

175. Stevenson, M. Archaeological investigations of the Kluane Gold Rush. 1980. (Research Bulletin, Parks Canada. no. 146.) (YUK)

176. Stevenson, M. Archaeological research in Kluane National Park, 1978. 1981. 11 p., illus., map. (Research Bulletin, Parks Canada. no. 150)
Summarizes some of the more significant historic sites recorded in Kluane National Park in 1970. Discusses the special nature and significance of Kluane's historic resources including placer mining. (YUK)

177. Yukon. Heritage Branch. Inventory of historic sites.
Unpublished inventory.
The Branch is compiling data on historic sites on inventory forms; it is estimated that there will be four to five hundred sites. They do not plan to develop a computerized data base. Sites in the National Parks are included in a data base maintained by the National Parks. The Branch does plan to plot sites on 1:250,000 and 1:50,000 scale maps.

7. TOURISM AND RECREATION

Through discussions with members of the Tourism Branch it was determined that visitor questionnaires administered by the Branch had not asked whether placer mining had had a negative or positive impact on a tourist's decision to visit the Yukon or his satisfaction with his visit. The Visitor exit survey (see item 180) undertaken in 1982 did determine that visiting historic sites and museums and shopping were the most popular activities among surveyed tourists.

178. Burton, Thomas L. Outdoor recreation in the Yukon : regional statistics to accompany the final report of "A Yukon Residents Outdoor Recreation Survey, 1977". Prepared for the Yukon Government and Parks Canada. Edmonton: University of Alberta. Dept. of Recreation Admininistration and Population Research Laboratory, 1978. 176 p., illus., maps.
Includes a profile of the survey population, summer and winter outdoor recreation activity patterns, annual vacation patterns, recreation satisfaction and usage of national and historic parks and sites. (COIN, 4th ed.)

179. Burton, Thomas L. Outdoor recreation in the Yukon : the final report of A Yukon Residents Outdoor Recreation Survey 1977. Prepared for the Yukon Government and Parks Canada. Edmonton: University of Alberta. Dept. of Recreation Administration and Population Research Laboratory, 1977. x, 202, 25 p., illus.
Provides data on outdoor recreation activity patterns. Intended to serve as a data base for the development of master plans for areas and facilities in the Territory and for Kluane National Park. (BIN)

180. Yukon. Dept. of Tourism, Recreation & Culture. Visitor exit survey. Whitehorse: May 1984. 69 p.
Results of a 1982 survey of 2158 visitor parties. Profiles visitors by their origin and by destination visited; describes characteristics such as length of stay, expenditures, activities pursued and trip satisfaction levels. Notes that shopping and visiting historic sites and museums were the most popular activities.

181. Yukon. Dept. of Tourism, Recreation & Culture. Yukon tourism industry hightlights, 1983. Whitehorse: 1984. 76 p., illus., maps, charts.
The 13th edition of an annual report. Includes statistics on the number of border crossings, visitor origins and expenditures, construction related to tourism etc. Does not include information on the relationship of tourism and placer mining.

182. Yukon. Dept. of Economic Development & Tourism. Tourism Information Services. Tourism statistics, 1983/84. Whitehorse: Oct. 1984. 1 v. (unpaged)
Presents statistics on the origin of tourists, trip duration and party size based on registrations at visitor centers. Also includes statistics on interest categories based on cards sent in by prospective tourists requesting information. Does not include information on the relationship of tourism and placer mining.

ITEM A

SOURCE: Canada. Dept. of Fisheries and Oceans. Whitehorse District.

TITLE: Annual narrative reports: Alesk-Taku, Northern B.C. - Yukon South, and Yukon Arctic sub-districts.

CONTENTS: The sample report reviewed for one of the districts contained the following sections:

I. General description
II. Fisheries - commercial salmon fishery
domestic salmon fishery
native food fishery
freshwater fishery
sport fishing

This section includes statistics on such subjects as commercial licences and value of the catch to fishermen; Canadian and American commercial salmon catches on the Yukon River and fall Chum catches; number of domestic salmon caught; weight of lake trout and whitefish caught; catch statistics by species and licence type; number of licences and salmon catch by Indian band, Indian food figures in pieces.

III. Spawning ground summary of ground surveys
IV. Environment, Multiple Water Use

This section includes commentaries on such issues as: Pollution, placer mining, mining, Beaufort Sea, hydro, highways and crossings, logging, land use

V. Trends in the Fishing Industry
VI. Enforcement
VII. Predators
VIII. Administration
IX. Information, education and other programs

Initially, there was only one report for the Yukon, now there are separate ones for each of the sub-districts as indicated above.

METHOD OF DATA COLLECTION: Information is collected during the course of operations of the District.

RECORD FORMAT:

INTERNAL UNPUBLISHED REPORTS: Hardcopy reports filed by sub-districts.

Availability status: Public. Current years are kept in the office; earlier ones are sent to the Federal Archives.

PUBLISHED REPORTS: Some of the information is included in the Annual review of the Dept. of Fisheries and Oceans, Pacific Region. See item 113 in Section 1 of the Inventory.

CONTACT: Al von Finster
Dept. of Fisheries and Oceans, Whitehorse District Office
122 Industrial Road, Whitehorse
667-2235

ITEM B

SOURCE: Canada. Dept. of Fisheries and Oceans. Whitehorse District.

TITLE: Area history of salmon catch (One for each of the sub - districts: Alesk-Taku; Northern B.C. - Yukon South; and Yukon Arctic)

CONTENTS: A narrative report covering special salmon fishing closures; a spawning ground summary; strikes; and developments calling for close observations complemented by a statistical report which provides weekly catch statistics by type of salmon caught, indicates the number of fishermen reporting catches and the total commercial, domestic and I.F.F. catch.

METHOD OF DATA COLLECTION: Data is collected during the course of Fisheries Officers' work.

RECORD FORMAT:
INTERNAL UNPUBLISHED REPORTS: Hardcopy reports filed by district and then by year within each district.

Availability status: Public.

CONTACT: Al von Finster
Dept. of Fisheries and Oceans, Whitehorse District Office
122 Industrial Road, Whitehorse
667-2235

ITEM C

SOURCE: Canada. Dept. of Fisheries and Oceans. Whitehorse District.

TITLE: Lake and stream files.

CONTENTS: Files contain a form listing the name of the stream, etc., indicating what river it is a tributary to; its location vis a vis roads, pipelines, etc.; its latitude and longitude; drainage area; length; width; species present; and a listing of surveys covering the area. Tomlinson notes that these files "...typically contain forms showing stream name, approximate latitude/longitude, and related sketch map, and details of benthic invertebrates, water chemistry, winter conditions and general assessment. Files may also contain information sheets for data collected at different times, correspondence relating to the particular stream, emergency modifications, and so forth." (Tomlinson Associates. Directory of data types and sources in the Yukon, Vol. 1.) The District Office is currently in the process of adding notes to the relevant stream files to indicate published reports in the library which contain information on each stream.

METHOD OF DATA COLLECTION: Data collected during the course of Fisheries Officers' work.

RECORD FORMAT:
INTERNAL UNPUBLISHED REPORTS: Hardcopy materials filed alphabetically by stream.

Availability status: Public.

CONTACT: Al von Finster
Dept. of Fisheries and Oceans, Whitehorse District Office
122 Industrial Road, Whitehorse
667-2235

ITEM D

SOURCE: Canada. Dept. of Fisheries and Oceans. Whitehorse District.

TITLE: Salmon stream and spawning ground reports.

CONTENTS: Form containing the name of the stream; the river it flows into; the dates of inspection and the particulars of spawning and spawning conditions by species of salmon; and information on the physical and biological condition of spawning grounds and obstructions. Space for other comments is provided.

METHOD OF DATA COLLECTION: Collected annually in the fall by Fisheries Management Officers.

RECORD FORMAT:

INTERNAL UNPUBLISHED REPORTS: Hardcopy forms filed alphabetically by district, then by year and stream.

Availability status: Public.

CONTACT: Al von Finster
Dept. of Fisheries and Oceans, Whitehorse District Office
122 Industrial Road, Whitehorse
667-2235

ITEM E

SOURCE: Canada. Dept. of Fisheries and Oceans. Whitehorse District.

TITLE: Spawning escapement catalogue.

CONTENTS: Information sheet for each stream lists stream name, conservation district, sub-district, location of the mouth of the stream, longitude and latitude, length, width, drainage, composition, percent gradient, wetted area, spawning area, discharge, temperature, barriers or points of difficult ascent, spawning distribution information by species indicating the section of the stream used, the potential of inaccessible portion of the stream and a general remarks section used to note comments from specific years. Not all sections of this form are filled out for each stream. A second form provides annual statistics on the escapement of each species of salmon; information on the arrival, start peak and end of the run; and additional remarks.

METHOD OF DATA COLLECTION: Catalogue is updated annually from other records compiled by the Office.

RECORD FORMAT:
INTERNAL UNPUBLISHED REPORTS: Hardcopy forms filed alphabetically by stream.

Availability status: Public.

CONTACT: Al von Finster
Dept. of Fisheries and Oceans, Whitehorse District Office
122 Industrial Road, Whitehorse
667-2235

ITEM F

SOURCE: Canada. Northern Affairs Program. Mining Claims Inspector's Office.

TITLE: Mining claims inspection reports.

DESCRIPTION/CONTENTS: Name of operation and owners, creek name and location on the creek, mining district, date of inspection, drainage of creek and DFO classification, equipment, shifts worked and number of employees, mining method including settling pond system and use of tailings, description of mining site and creek length mined, location of the camp and fuel storage area.

METHOD OF DATA COLLECTION: Annual visits by inspectors: within the two years 1983 and 1984, each operation was visited at least once.

TIME PERIOD COVERED BY DATA: 1983 -

RECORD FORMAT:

INTERNAL UNPUBLISHED REPORTS: Written reports supplemented by colour photographs of the operation. While a form is not used, inspectors do have a Tentative check list for placer operations listing 14 matters to be investigated and a list of 15 items to be photographed. They also have a list of 20 potential hazards to check for in relation to mine safety.

The reports and photographs are filed in binders by Creek name then by operation and by year.

Availability status: Public.

CONTACT: George Gilbert, Mining Claims Inspector
200 Range Road, Whitehorse
668-5151

ITEM G

SOURCE: Canada. Northern Affairs Program. Mineral Rights Division.

TITLE: Mining claims records.

CONTENTS: Five sets of files:
1) Register of applications ledger: showing record #, grant #, location description (e.g., stream name, mile), staker's name
2) Claim file: contains all documentation concerning the claim, e.g., the grant, lease or record #, claim name and #, claim map sheet #, date of staking and recording, status of claim and owners name.
3) History record sheet for each claim and lease: shows grant, lease or record #, claim name and #, date of staking and recording, status of claim and owners name.
4) Claim ownership files: showing record #, claim map sheet #, claimholder's name.
5) Lapsing card file: shows record #, claim map sheet #, claim name, lapsing date

METHOD OF DATA COLLECTION: Records filed with the Mining Recorder

TIME PERIOD COVERED BY DATA: 1894 -

RECORD FORMAT:
INTERNAL UNPUBLISHED REPORTS: Hardcopy ledger book, files and cards. The office maintains a set of index cards by claim owner which provide access to the other files.

Availability status: Public.

PUBLISHED REPORTS:
Some information is published in Mines and minerals statistics, see item 30 in section 1 of the inventory.

COMPUTER BASED DATA:
A regional mini-computer is to be installed to handle mining claims documentation. To date, software has not been developed.

CONTACT: Blake Baxter, Regional Manager, Mineral Rights Division
200 Range Road, Whitehorse
668-5151 ext. 308

ITEM H

SOURCE: Canada. Northern Affairs Program. Water Resources Division.

TITLE: Water resource information system.

CONTENTS: Presently under development, expected to be a series of 5 related computer based files. The summary file, the only one established to date, contains information from the first page of the water licence and specific operating requirements. The other files will contain water quality data collected by the water management officers during their inspections and submitted to the Water Board by the miners, summaries of water management officers inspection reports and waterflow data.

Until the software for the water quality data and other files is developed, 1985 data will be maintained manually in the Division's files which are organized by operator and then by operation.

METHOD OF DATA COLLECTION: The Yukon Territory Water Board supplies copies of relevant documents received and issued by that agency; other data will come from Water use inspection reports filed by the Division's water management officers.

TIME PERIOD COVERED BY DATA: Presently contains only information from current water licences. Once the software for the other files is developed relevant current data and required water quality and licence information from the Division's computerized Water quality file, 1984 will be incorporated in it.

RECORD FORMAT:
COMPUTER BASED DATA: Computerized file developed using D-base II; runs on a Wang PC. Data can be searched on each element.

Availability for on-line searching: Contact the Division.

CONTACT: Jack Nickel, Administrator, Pollution Control
Water Resources Division
200 Range Road, Whitehorse
668-5151

ITE.

SOURCE: Canada. Northern Affairs Program. Water Resources Division.

TITLE: Water quality file, 1984.

CONTENTS: Information from water licence applications and the licences themselves supplemented by information from the Water use inspection reports prepared by the Division's water management officers and the reports filed by miners with the Water Board.

METHOD OF DATA COLLECTION: The Yukon Territory Water Board supplies copies of relevant documents received and issued by that agency; water quality data is obtained through site visits by the Water Division's water management officers.

TIME PERIOD COVERED BY DATA: 1984 File will not be updated; where required, licence information and water quality information will eventually be incorporated into the Division's new Water resource information system.

RECORD FORMAT:
COMPUTER BASED DATA: Computer based file developed using Multiplan; runs on a Wang PC.
Availability for on-line searching: Contact the Division.

CONTACT: Jack Nickel, Administrator, Pollution Control
Water Resources Division
200 Range Road, Whitehorse
668-5151

ITEM J

SOURCE: Canada. Northern Affairs Program. Water Resources Division.

TITLE: Water use inspection reports.

CONTENTS: Two types of inspections are done;
1) detailed investigations of the settling ponds, drainage ditches, etc. on mining sites
2) brief inspections which concentrate on ensuring that the operator is complying with his licence requirements.

Water samples taken from upstream, downstream and at the effluent discharge are tested for settleable solids, suspended solids, turbidity and PH. Samples are sometimes tested for dissolved solids, and conductivity. Some analysis testing was done in 1984. Though only one sample per location for each operation has been taken in the past, in 1985 three effluent samples may be taken per operation.

In 1984, the Division also began collecting baseline water quality data on creeks above all mining operations. About 400 samples were analyzed and some of this data was entered into the Division's Water quality file, 1984.

The short form in use has the following sections: holder; authorization number; person contacted; location; type of operation; type and number of machinery; current stage of operation; observations or comments. A revised long form not yet in general use provides for recording much more detailed information. For example, the location, number, dimensions, stability, construction materials, and comments/problems on each operation's reservoir, settling ponds, recirculation pond, spillways, effluent drains, diversion, and protection berm are to be recorded. In addition, information is to be recorded on water acquisition, intake controls, rate of water use, water flow rates, estimated total retention time, water quality monitoring data, fuel storage, camp waste, whether the plant and equipment are as listed on the application, and the situation regarding rehabilitation of disturbed lands.

METHOD OF DATA COLLECTION: Visits by water management officers. In 1984, these officers averaged one visit per site; this is not necessarily what they will average in 1985.

TIME PERIOD COVERED BY DATA: 1972 - . However, there is little placer data prior to 1982.

RECORD FORMAT:

INTERNAL UNPUBLISHED REPORTS: Form supplemented by written reports. These are filed with the Division's files on each operator. These files are subarranged by operation and include a copy of the water authorization/licence, all reports of water management officers and other correspondence and reports related to each operation.

Availability status: Public.

COMPUTER BASED DATA:

Some 1984 water quality information is included in the Division's Water quality file, 1984. This information, current water quality information and summaries of the other data will be included in the Division's Water resource information system.

CONTACT: Jack Nickel, Administrator, Pollution Control
Water Resources Division
200 Range Road, Whitehorse
668-5151

ITEM K

SOURCE: Yukon Territory Water Board.

TITLE: Water licence applications, licences, miners' monthly and annual reports.

CONTENTS: 15 page application form filled out by miners includes information on the location of the mine, observations on water quality and water flow, planned rate of water use, volume of material stripped and processed, equipment and fuels used, plans for overburden removal, stream channel diversions, processing, tailings disposal, waste water disposal and rehabilitation. A mine site layout plan and dam, dyke, water supply reservoir, settling pond drawings are attached. These applications are reviewed by the Board's technical staff. Should additional information be required, applicants are contacted.

Copies of these applications are sent to Fisheries and Oceans, the Environmental Protection Service and the Water Resources Division of the Northern Affairs Program for their comments. The Water Resources Division has a five page form on which they note the conditions they recommend the miner meets before a licence is issued. This form indicates acceptable settleable solids levels. whether or not water course diversions are to be allowed and the flood frequency level they must meet, whether or not leave strips are required, comments on the acceptability of the proposed method of water acquisition and rate of use, comments on water control structures and rehabilitation, and other general comments. The other two agencies appear to respond by letter to specific points of concern to them. The Board is not bound by comments made by these agencies.

The date for a public hearing on the application is set and advertised in the Canada Gazette and local newspapers. If no one gives written notice of intention to intervene or comment at the hearing by 10 days before the date set for the hearing, the hearings are cancelled unless the miner himself has indicated that he wishes to speak to the Board at a public hearing on his application.

The licence itself indicates the conditions the miner must meet. Copies of the licences together with a summary of the Board's "Reasons for Decision" for each application are sent to the Director General of Northern Environment, Northern Affairs Program in Ottawa for the approval of the Minister of Indian and Northern Affairs.

Each operation requires a separate licence unless the licence is for water use on contiguous claims being mined by the same operator. Licences are numbered consecutively in the order in which the applications are received; the year in which the licence is issued is prefixed to this number to form the licence number.

METHOD OF DATA COLLECTION: Miners submit the application forms; other data is gathered as indicated above.

TIME PERIOD COVERED BY DATA: This process was first used in 1984.

FREQUENCY OF UPDATING: Licences are for a 1 to 3 year period. Miners must also submit monthly water quality reports on a form developed by the board and an annual report summarizing their monitoring data and noting any changes in their operating plans from those described in their original application. To date, only a small proportion of miners have complied with these reporting requirements. As of Jan. 15, 1985, only 109 licensed operations out of 206 active operations had submitted annual reports; and only 79 of these operations submitted data on monitored water quality. (Placer miners 1984 season water quality monitory program and annual reports : review and evaluation by J.A. Polyck, Chief Water Management Officer, see Section 1, item 85)

VOLUME OF RECORDS: 294 licences were issued in 1984. (However, note that the report cited above says there were 278 licences issued in 1984)

RECORD FORMAT:

INTERNAL UNPUBLISHED REPORTS: One copy of the application, supporting documents and the licence is filed by licence number. Amendments are also separately filed by number.
A second copy of approved applications, licences and amendments to licences is filed by the name of the operator. Files by operator also include copies of monthly and annual miners' reports.

Availability status: Public.

COMPUTER BASED DATA: The Board itself does not maintain a computer based data file. However, the Water Resources Division of DIAND used data from the applications, licences and miners water quality reports in its Water quality file, 1984 and will use information from the latter two files in its Water resource information system.

In 1984 the Environmental Protection Service also created a data base derived from this data; however they do not intend to maintain this data base.

CONTACT: Dianne Grainger, Chairman, Yukon Territory Water Board
or Andree North
#200 - 4114 4th Ave., Whitehorse
668-4884

The title listing provides up to the first 65 characters of each title. The number to the left of each title is the number of corresponding entry in Section 1 of the inventory.

157 Additional environmental information of the Sixty Mile River in
133 An analysis of three sport fisheries
109 Annotated bibliography and information summary on the fisheries
122 Annual narrative reports: Alesk-Taku, Northern B.C. - Yukon South, and Yukon Arctic sub-districts. SEE ALSO Section 2, item A.
113 Annual review, Canada. Dept. of Fisheries and Oceans. Pacific
97 Application of hydrocyclones for the treatment of wastewater in
154 Aquatic and wildlife resources of seven Yukon streams subject to
175 Archaeological investigations of the Kluane Gold Rush
176 Archaeological research in Kluane National Park, 1978
123 Area history of salmon catch. SEE ALSO Section 2, item B.
61 An assessment of the proposed Yukon placer mining guidelines
147 An assessment of the fisheries resource in 18 lakes within the Yu
90 The attainment and cost of placer mining effluent guidelines
64 Benefit-cost analysis of the proposed Yukon placer mining guideli
9 Bibliography of references pertaining to placer deposits, explora
74 Bibliography of water quality information
174 A bibliography of Yukon archaeology, anthropology, and quaternary
164 Biological and water quality assessment at a placer mine on Barlo
144 A biological investigation related to placer mining operations
1 Boreal northern titles
21 Brief history of placer mining in the Yukon
116 British columbia stream habitat and fish population inventory sys
65 The calculation of costs in the IEC-Beak report
26 Canada`s mineral production: preliminary estimate.
170 Canadian heritage inventory network (CHIN)
54 Christensen Report.
72 A code of environmental practice in Alaskan placer mining
88 Commentary on placer mining effluent treatment.
142 Comparative study of the use of disturbed and undisturbed areas b
59 The contribution of the placer mining industry to Yukon's econom
114 Culvert guidelines: recommendations for the design and installati
106 Development & demonstration of treatment technology for the place
5 Directory of data types and sources in the Yukon.
66 Discussion of benefit-cost analysis of Yukon mining guidelines
130 Domestic and commercial questionnaires (on the fishery)
136 Economic feasibility of a freshwater fish commercial fishery and
56 Economic growth in Yukon, 1983 - 2003.
138 The economic value of the Yukon sport fishery
73 Effects of placer mining on hydrologic systems in Alaska: status
169 The effects of placer mining on the environment in central Alaska
117 Effects of sedimentation on salmonids and macro-invertebrates.
118 Effects of sedimentation on salmonid stream life
155 Effects on Arctic grayling (Thymallus arcticus) of prolonged expo
156 Effects on Arctic grayling (Thymallus arcticus) of short-term exp
145 An environmental assessment of the Sixty Mile River in summer
158 An environmental assessment of the Sixty Mile River in winter
104 Environmental studies, Clear Creek project, sediment control plan
163 Environmental studies, Clear Creek gold dredging: preliminary fin
149 An evaluation of aquatic resources of Big Creek, Yukon Territory

135 Evaluation of incremental recreational benefits for salmonid enh
107 Evaluation of settleable solids removal at Alaska gold placer m
89 Evaluation of wastewater treatment practices employed at Alaskan
119 Fish and wildlife in British Columbia: a review of resource valu
141 Fish and wildlife habitat recovery in placer mined areas of the
111 The fish resource of the Yukon Territory
108b Fisheries and fish related publications on the Yukon
108a Fisheries information and stream reach classification maps
159 Fisheries investigations of Clear Creek, Yukon Territory, in 197
27 General review of the mineral industries: mines, quarries and oi
11 GEOSCAN
173 The goldfields history recording project: a report on and compil
49 Government response to KPMA "10 principles"
44 Guidelines for establishing water quality objectives for the ter
140 Guidelines for reclamation of placer mining operations - Klondike
120 Handbook for fish habitat protection on forest lands in British
137 A historical overview of fishing in the Yukon
86 Historical sediment data summary for Canadian rivers, 1978.
62 Impact on the Yukon economy of the gold placer mining indus 1979
63 Impact on the Yukon economy of the gold placer mining indus 1980
67 Input-output for Yukon and Yukon River Basin
45 Interim guidelines for the issuance of authorizations to use wate
177 Inventory of historic sites
28 Jewellery and silverware industry.
124 Lake and stream files SEE ALSO Section 2, item C
35 Land use guidelines, mineral exploration: Yukon and Northwest Ter
2 Land use information series [maps].
160 Life history and habitat utilization of Arctic grayling (Thymallu
165 Little Gold - a biological and water quality assessment at a plac
146 Matson Creek environmental assessment
29 Metal mines.
90 Methods and costs for the attainment of placer ....effluent
70 Methods, environmental impacts, treatment and control, reclamatio
16 Mineral industry incentive programs and services
14 Mines and mineral activities
30a Mines and minerals statistics.
31 Mining claims inspection reports SEE ALSO Section 2, item F.
8 Mining claims maps.
30b Mining claims records. SEE ALSO Section 2, item G.
12b Mining recorders records (placer) 1894-1972 : finding aid
12a Mining technology database
75 Muddy waters: placer mining and our aqueous environment
79 National water quality data (NAQUADAT)
7 Natural features habitat inventory
131 1980 survey of sportsfishing in the Yukon.
77 1984 placer mining inspections; summary of problems and non-activ
32 1984 Yukon mining and exploration overview.
172 1981 goldfields historical survey or a report on a brief survey
139 Natural revegetation of placer mined lands of interior Alaska II.
37 Northern inland waters act, R.S.C. 1970, S 1, c. 28 as am to S.C.
38 Northern inland waters regulations
36 Northern natural resource development: requirements, procedures a
1 Northern titles.
68 Note to file - placer mining; expenditures and production of the
22 Notes on placer mining in the Yukon Territory

178 Outdoor recreation in the Yukon : regional statistics to accompan
179 Outdoor recreation in the Yukon : the final report of A Yukon Res
129 [Paper presented] at public meeting to discuss freshwater commer
85 Placer miners 1984 season water quality monitorying program and a
87 Placer mining and water quality
18 Placer mining industry in Yukon and Atlin mining division, B.C.
24 Placer mining in the Yukon
17 Placer mining in Alaska
69 Placer mining...its role in the Alaskan economy
42 Placer mining operating guidelines in regard to water use authori
55 Placer mining regulations and guidelines for the protection of th
98 Placer mining settling pond design handbook
99 Placer mining wastewater settling pond demonstration project repo
103 Placer mining wastewater treatment technology report
150 Preliminary biological reconaissance of the sixty mile river flo
101 Preliminary draft of placer mining recycle system design handbook
167 Preliminary summary and analysis of suspended sediment data from
91 A rationale for standards relating to the discharge of sediments
76 A rationale for the classification of rivers, streams and lakes
48 Rationale for the principles for placer mining industry guideline
47 Recommendations of the Yukon Chamber of Mines and the KPMA to the
10 References to placer creeks in Yukon.
52 Regulation of placer mining: Yukon government position.
43 The regulation of water use in placer mining in Yukon territory
171 Regulations for the protection and care of archaeological sites i
143 Rehabilitation of Sixty Mile River valley
148 Report concerning environmental considerations of Cogasa Mining C
94 Report on the Technical Workshop on suspended solids and the aqua
23 A report on the Yukon placer mining industry
54 Resources, regulations & reality; report of the Yukon Placer Mini
115 A review and resolution of fish passage problems at culvert sites
60 A review of the impact of proposed placer mining guidelines on Fi
96 Review of Yukon placer mining operations and cost estimates for a
162 Russell Creek placer mining operation. Unpublished note.
125 Salmon stream and spawning ground reports. SEE ALSO Section 2, item D
93 Settling facilities at Yukon placer mines.
102 Settling pond design
84 Small stream investigation in Yukon territory, 1975-1981
57 Socio-economic impact analysis of draft guidelines for the Yukon
126 Spawning escapement catalogue. SEE ASLO Section 2, item E
112 Statement of Fisheries Service concerns and responsibilities pres
127 Status report on fur, fish and game harvest data in the Yukon Ter
161 Stream habitat inventory and evaluation for two study areas in th
71 A study of mercury usage in placer mining operations in Yukon Tei
100 A study of polyacrylamide flocculants in the Yukon placer mining
100 A study of the potential use of polyacrylamide flocculant use in
151 Summary and analysis of fish capture data from placer mining stud
152 Summary and analysis of sediment and preliminary biological data
58 Summary of analysis of economic reports for Yukon placer mining
41 Summary of the applications for a water use licence for placer
83 Surface water data, Yukon Territory
132 Survey of sportfishing in the Yukon Territory in 1975
39 Territorial dredging regulations
182 Tourism statistics, 1983/84.

166 Treatment of fisheries information collected from Clear Creek, Yu
95 Treatment of placer mining effluents using settling ponds. Volume
92 Use of flocculants in placer mining; a supplement to "The attainm
180 Visitor exit survey
34 Water licence applications, licences, miners' monthly and annual reports SEE ALSO Section 2, item K
81 Water quality file 1984 SEE ALSO Section 2, item I
168 Water quality studies of placer mining operations on Livengood an
80 Water resource information system SEE ALSO Section 2, item H
82 Water use inspection reports SEE ALSO Section 2, item J
105 Water use technology for placer mining effluent control
6 Yukon bibliography, 1964 -
33 Yukon economic review.
13 Yukon exploration and geology
128 The Yukon fishery resource: its existing role and its future pot
53 Yukon government summary statement on proposed Yukon placer minin
3 Yukon land and resource inventory: bibliographic index.
4 Yukon land resource and inventory atlas.
110 [Yukon mapping project - placer mining and fish resources]
19 Yukon mineral industry, 1941 to 1959
15 Yukon placer mining.
20 Yukon placer mining industry 1978-1982.
51 Yukon placer mining guidelines: summary statement.
50 Yukon placer mining guidelines, draft for discussion purposes
46 Yukon placer mining: a position paper
40 Yukon placer mining act, RSC 1970, c. Y-3 as am by R.S.C. 1970 S1
153 Yukon placer mining study
121 Yukon River Basin study; Fisheries Work Group program report
134 Yukon sport fishery: a policy oriented assessment of sport fishin
181 Yukon tourism industry hightlights, 1983.
78 Yukon water resources management policy and institutional issues: